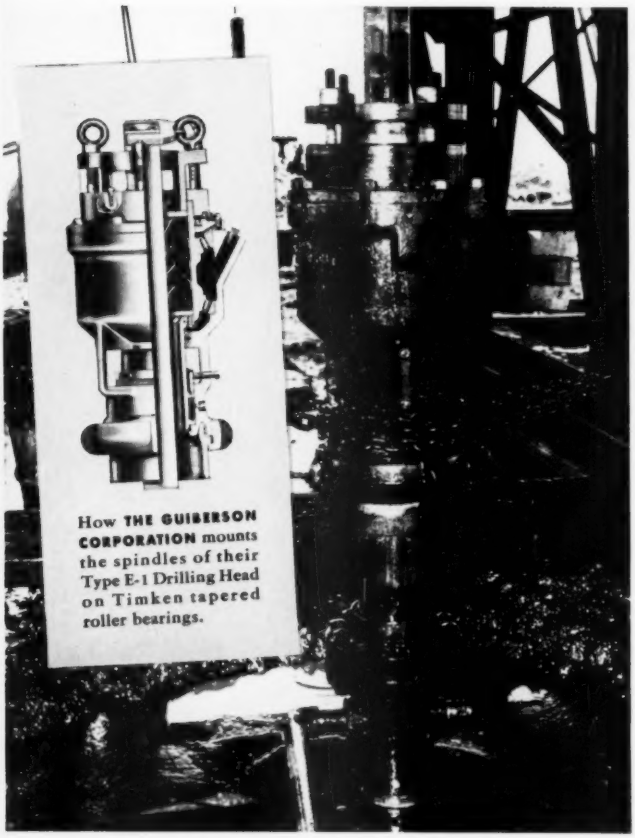
the OIL AND GAS JOURNAL

How TIMKEN® bearings keep a wash pipe seal in perfect alignment



How **THE GUIBERSON CORPORATION** mounts the spindles of their Type E-1 Drilling Head on Timken tapered roller bearings.

THIS Guiberson Type E-1 Drilling Head permits the use of reverse circulation. The mud seal in the head must withstand drilling mud under pressure. Timken® tapered roller bearings mounted on the spindle that carries the wash pipes do these three jobs: 1) take the heavy thrust load with ease. 2) provide long bearing life. 3) keep wash pipe in perfect alignment.

Line contact between the rollers and races of Timken bearings provides extra load-carrying capacity. The tapered construction of Timken bearings enables them to take radial and thrust loads in any combination. Timken bearings hold shafts in rigid alignment—reducing wear, minimizing maintenance.

Because of incredibly smooth surface finish and true rolling motion Timken bearings practically eliminate friction. And Timken bearings will normally last the life of the machine in which they are used because they're engineered for the job, precision manufactured, and made of Timken fine alloy steel.

No other bearing can give you all the advantages you get with Timken tapered roller bearings. Insist upon them for all the oil field equipment you build or buy. Always look for the trade-mark "Timken" on every bearing. The Timken Roller Bearing Company, Canton 6, Ohio. Canadian plant: St. Thomas, Ontario. Cable address: "TIMROSCO".

This symbol on a product means its bearings are the best.

TIMKEN
TRADE MARK REG. U. S. PAT. OFF.
TAPERED ROLLER BEARINGS

NOT JUST A BALL ○ NOT JUST A ROLLER ▭ THE TIMKEN TAPERED ROLLER ▭ BEARING TAKES RADIAL ◫ AND THRUST ←◫→ LOADS OR ANY COMBINATION ✳

FIELD TESTED

REMARKABLE RECORD FOR SAVING RIGTIME

A long list of triumphant field trials has earned top honors in the oil world for Halliburton's Retrievable Cementer.

It can be run in rapidly on tubing or drill pipe, set and used for a series of squeeze jobs, then immediately removed!

A remarkable saving in rigtime results, and wells are producing sooner by hours.

Your Halliburton representative will be happy to give you a detailed report.

"THERE'S NO SUBSTITUTE FOR EXPERIENCE IN OIL WELL CEMENTING"

NO METAL TO DRILL

- LOCATE PERFORATIONS
- PUMP CEMENT, ACID OR PLASTICS
- PLACE CEMENT AROUND CASING SHOE
- CEMENT IN OPEN HOLE
- RUN MULTIPLE CEMENT JOBS
- FIND AND REPAIR LEAKS

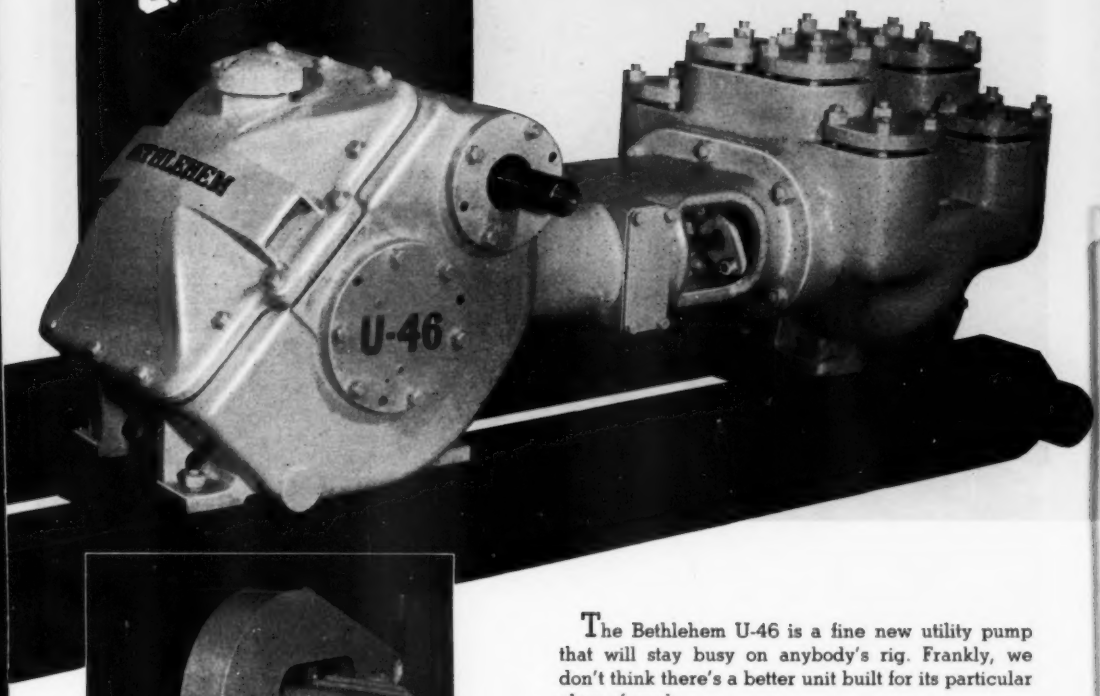
HALLIBURTON

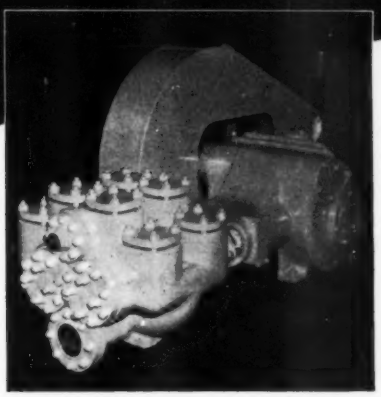
RETRIEVABLE CEMENTER

HALLIBURTON OIL WELL CEMENTING CO.

DUNCAN, OKLAHOMA

Here's a Great Little Pump for Utility Work





The Bethlehem U-46 is a fine new utility pump that will stay busy on anybody's rig. Frankly, we don't think there's a better unit built for its particular class of work.

The U-46 is a horizontal, duplex, double-acting pump with 4-in. bore and 6-in. stroke. Its primary duty is fresh-water pumping around the rig—getting up the water for mixing, brake-cooling, rig wash-downs, etc. But its fluid end can be equipped to handle oil and mud as well; salt water too, whenever you have a disposal job around a lease.

Speaking of leases, the U-46 is a wonderful performer on gathering work. And there are plenty of other spots where it can pinch-hit on short notice. Mighty handy fellow to have around!

This completely portable unit can be furnished with any type of prime mover—electric motor, gas, gasoline, or diesel engine. Full details and specifications are available through our nearest sales office.

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In thirty-five years Brown & Root has built a tremendous backlog of satisfied clients . . . clients who have time and again called on Brown & Root to do another job.

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It's bad air that does it. But you can step up production by putting a Coppus Blower on the job to keep the air moving — and keep the men cool.

The kind of air a man works in has a lot to do with how much work he can turn out.

In confined places like shipholds or tanks or drums or boilers . . . or wherever the air is stagnant or hot or full of fumes . . . a Coppus Blower is a *must* for getting first-class work out of the men, all the time.

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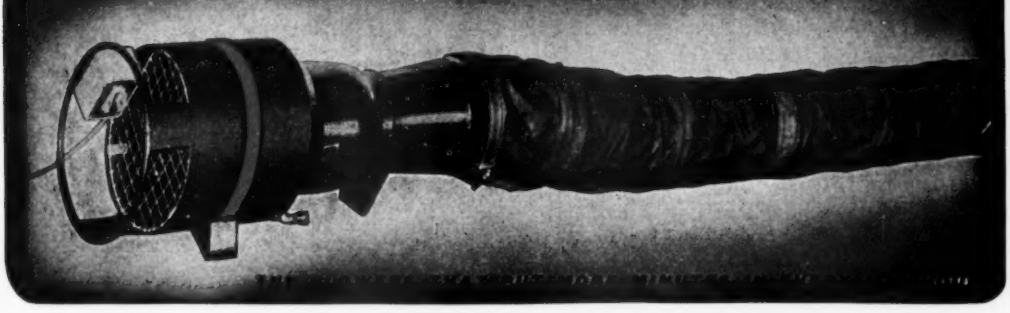
Portable and adaptable for special purposes, Coppus Blowers and Exhausters will have dozens of uses around your plant. The "Blue Ribbon" (a blue painted band) is your assurance of quality performance at lowest cost.

COPPUS

BLUE RIBBON BLOWERS



CABLE MANHOLE AND TANK VENTILATORS — BOILER MANHOLE BLOWERS AND EXHAUSTERS — HEAT KILLERS — SHIPHOLD VENTILATORS . . . DESIGNED FOR YOUR INDUSTRY — ENGINEERED FOR YOU

MAIL THIS COUPON To Coppus Engineering Corp., 271 Park Avenue, Worcester 2, Mass. Sales offices in THOMAS' REGISTER. Other "Blue Ribbon" Products in BEST'S SAFETY DIRECTORY.

PLEASE SEND ME INFORMATION ON SUPPLYING FRESH AIR TO MEN WORKING:

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(Write here any special ventilating problem you may have.)

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You spend less for upkeep by using Dependable Quality

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. . . That's why More Crane Valves are used than any other make!

smooth, full flow through this new pipe-line valve

Conduit-type, double-seating disc in this new Crane valve has circular openings that coincide with seat openings. Flow resistance is reduced to a minimum. There are no pockets to accumulate dirt or contaminating fluids. Turbulence and erosion of seating surfaces are avoided.

Easy operation, long life, and reduced maintenance are assured by provision for thorough lubrication of all working parts. Body and bonnet are packed with grease which is retained by patented spring-loaded plates. Stem is inclosed in grease filled yoke with lubrication fitting.

Ask your Crane representative about these new valves for crude, finished product, and gas lines.

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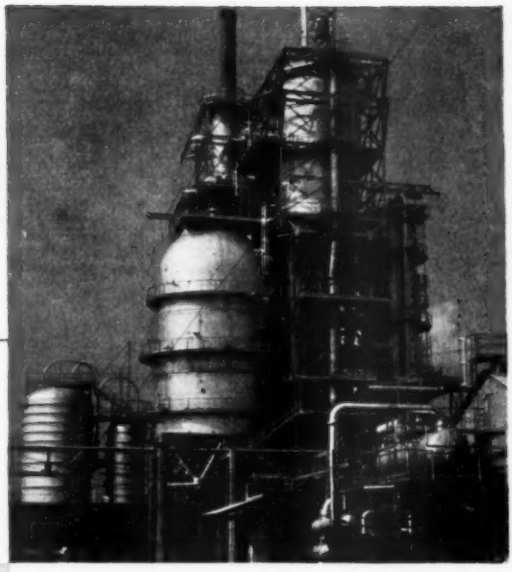
The Oil and Gas Journal, published Thursdays by The Petroleum Pu blishing Company. Entered as second-class matter September 1, 1910, at post office at Tulsa, Okla., under act of March 3, 1879. U. S. and foreign rates to the petroleum industry, $3 yearly. Copyright 1951.

Cat-Lube* does double duty for Sohio



Sohio's continuous contact filtration and catalytic cracking units

The Sohio lube finishing unit represents the most advanced engineering concept for the continuous contact filtration process. In this plant, operating and maintenance costs are reduced and capital investment was lowered as compared to earlier installations. Fluidized handling of the adsorbent permits a dust-free operation and hence a marked improvement in unit housekeeping. These are obvious important advantages but Sohio has added to them equally important economies through the use of Filtrol's Cat-Lube (Adsorbent Catalyst).

FILTROL DOUBLE-DUTY CAT-LUBE IMPROVES MAJOR OPERATING ECONOMIES

Filtrol Cat-Lube at Sohio's Lima plant does double duty. After bringing the finished oil to high specifications demanded of the decolorizing step at the lube plant, the spent adsorbent filter cake is slurried with fresh cat cracker feed and pumped to the fluid catalyst cracking unit. Although this unit is not equipped with a precipitator, activity maintenance is good and the "cat cracker" has continued to show a high level of performance.

Write for full information on Cat-Lube

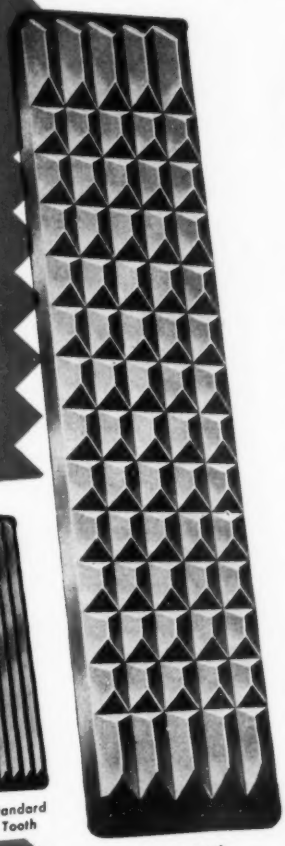
FILTROL CORPORATION

OFFICES: 722 WEST SEVENTH ST., LOS ANGELES 17, CALIFORNIA
PLANTS: VERNON, CALIF.; SALT LAKE CITY, UTAH; JACKSON, MISS.

Filtrol CATALYSTS AND ADSORBENTS

*T. M. REG. U. S. PAT. OFF.

FOR SAFETY'S SAKE ALWAYS GET THE ORIGINAL



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"NO CHIP"

SOFT END TONG DIES

YEARS AGO, Demco saw the dangers of brittle, chipping tong dies *and was the first to produce a safe, soft end NO CHIP die* to eliminate this drilling hazard! Always the leader — Demco's *original* "NO CHIP" dies are today the product of the most advanced engineering and production methods known. You can depend on it — if these dies could be made *better* in any way other than the Demco Patented Method — Demco would be using that method!

ALWAYS LOOK for these GREEN ENDS

Yes — for safety's sake — always look for the green ends on the Demco Tong Dies! They give you the "GO" sign on speedy, safe installation! The ends are soft — they WON'T CHIP!

Available thru your local supply store

- MAXIMUM GRIPPING POWER — even on flame hardened surfaces!
- LONGER LIFE reduces need for too frequent changing of dies!
- SAFETY FEATURE helps reduce accidents on derrick floor!
- REVERSIBLE for longer wear . . . more convenient installation!

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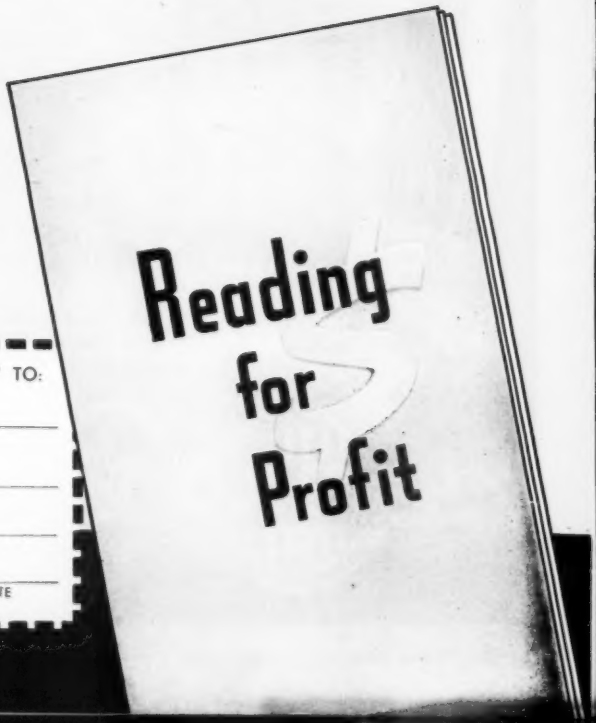

To Get the Most from the Least

You can make more money than you have. You can't make more time . . . time to manage your business affairs, answer your correspondence, keep appointments, do all the other things that have to be done, or make extra precious minutes for reading. Yet the facts, thoughts, new techniques and methods available from reading are vitally important to your business success.

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The Oil and Gas Journal invites you to invest five minutes or less in "Reading for Profit." It was prepared as a public service to explain the method of increasing reading speed. It costs nothing in money, and only five minutes in time . . . yet in can mean so much to you . . . your career . . . your business.

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is a quality product.
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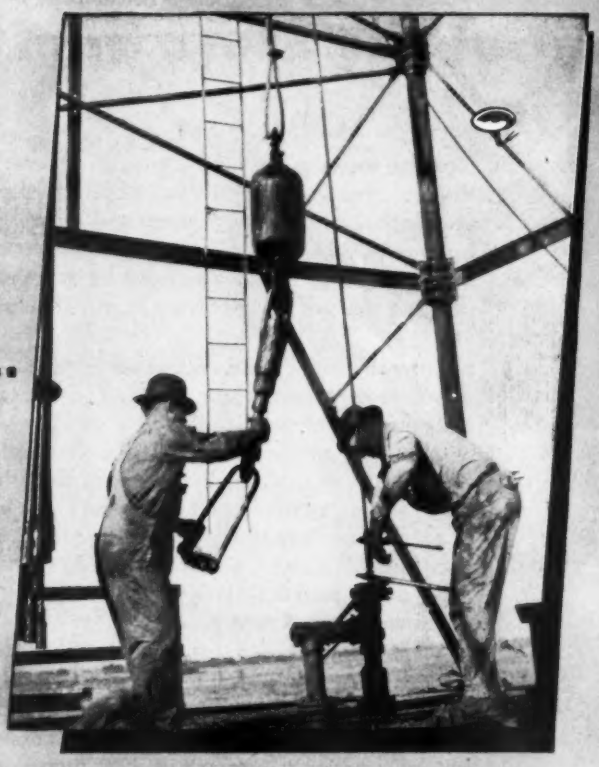

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UNMATCHED for boosting condensate recovery

UNMATCHED for increasing revenue

Ask your Parkersburg representative to show you the actual case histories of Hyreco Profit-Making Performance!

Each Hyreco installation adds to the record of successful performances which this high pressure gas condensate processing unit is establishing. In every case the operator has been able to recover more condensate . . . substantially increase revenue from his gas wells . . . lower operating cost by prevention of line freezing trouble and expense.

No similar equipment available today can process high pressure gas at such low temperatures . . . recover such a high percentage of condensate and pay for itself in such a short time. You owe it to yourself to get all the facts about the revenue-increasing possibilities with Parkersburg Hyreco.

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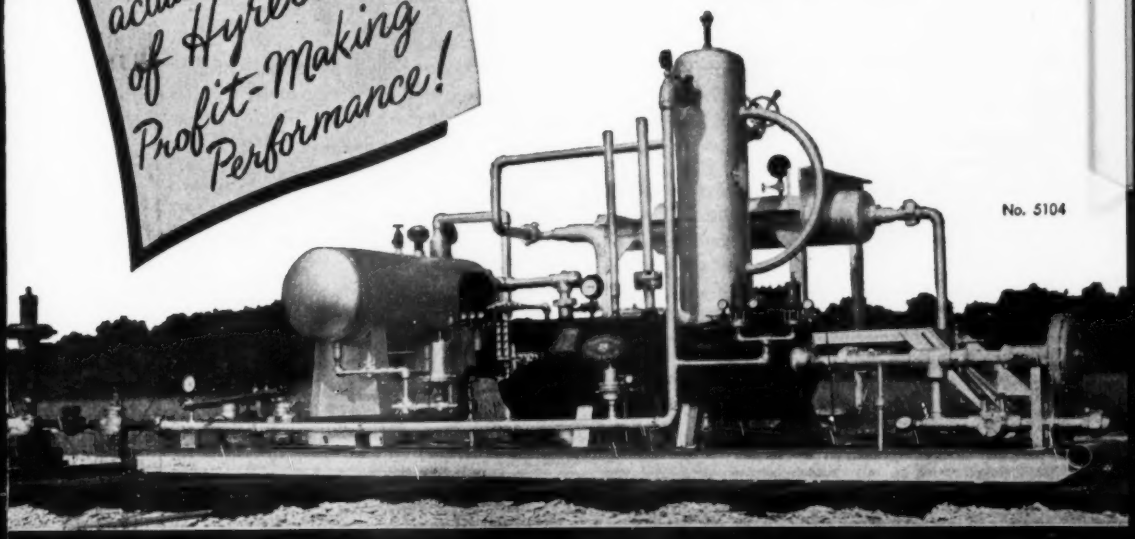

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Manufactured in Houston, Texas

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What's the smallest coin you can use to cover this system?

TRY IT YOURSELF! You'll find a half-dollar too large. Same with a quarter and a nickel. A dime's too small. But a penny covers it exactly—with the smallest amount of money.

•

Our goal is to be able to cover any and every system as efficiently as a penny covers the one above. Pipe-line progress is going ahead by leaps and bounds. And the Bell System is working right along with the pipe-line industry, keeping pace with its communications needs.

Our business is communications. We have an army of trained technicians with supplies of precision equipment. With over 4500 miles of integrated microwave radio systems already in operation, we have years of experience in their long-distance application. Our networks of cables and radio relay facilities have taught us much about setting up routings — and alternate routings.

Bell System communications are flexible and quickly adjustable to new and improved methods. Our research and development people are always at work. The newest methods . . . the newest equipment . . . and Experience . . . spell Service as offered by Bell System communications.

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Your Bell Telephone Company will be glad to study your communications problems and needs without charge.

PRIVATE-LINE TELEPHONE

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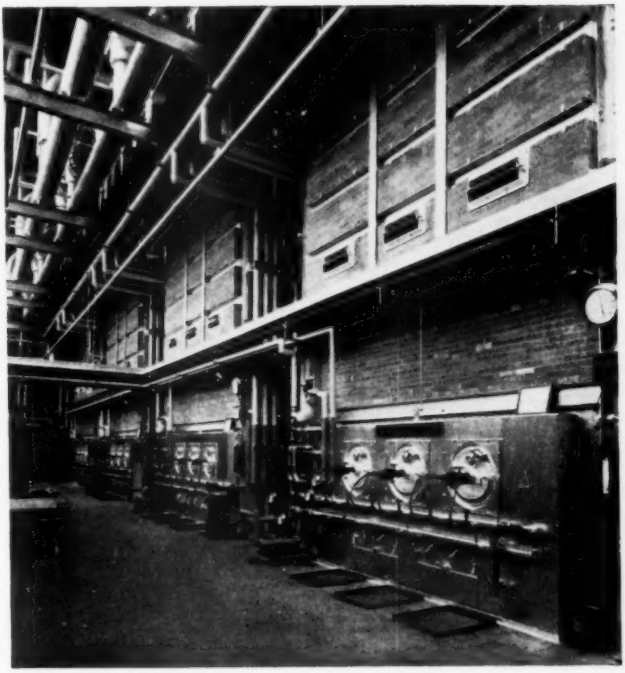
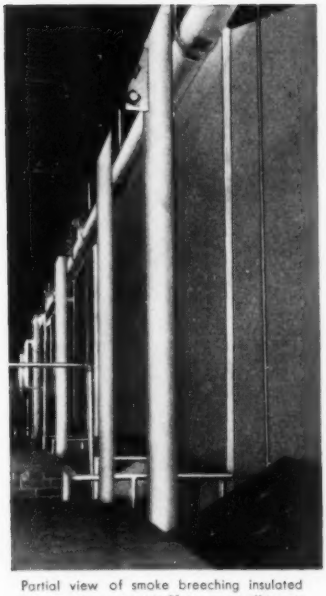
BELL TELEPHONE SYSTEM

Boiler room of Buffalo State Hospital, Buffalo, N. Y. All boilers, heated equipment, and steam lines are insulated with "Featherweight" 85% Magnesia. Cold water pipes insulated with K&M Duplex.



More than four and one-half miles of steam lines



Partial view of smoke breeching insulated with "Featherweight" 85% Magnesia 3" blocks and finished with Asbestos cement.

OWNER: State of New York
ARCHITECT: Cornelius J. White, State Architect
GENERAL CONTRACTOR: The John W. Cowper Co., Buffalo, N. Y.
HEATING CONTRACTOR: Quackenbush Company, Buffalo, N. Y.
INSULATION CONTRACTOR: E. J. Eddy, Inc., Buffalo, N. Y.

—insulated with "FEATHERWEIGHT"® 85% MAGNESIA

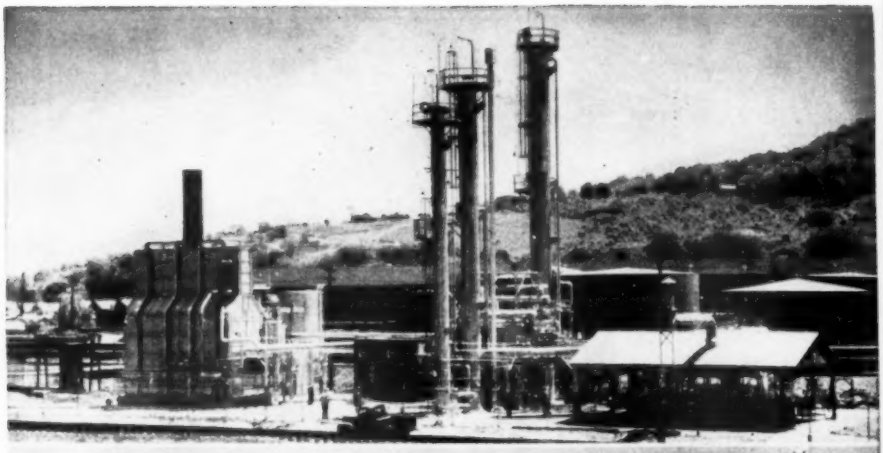
From the new boiler house of the Buffalo State Hospital, 24,000 lineal feet of piping carry steam throughout the institution. And, to guard against heat losses, the entire system—pipes, boilers, smoke breeching, and other heated surfaces—is insulated with "Featherweight" 85% Magnesia.

"Featherweight" 85% Magnesia provides efficient, durable insulation at a cost that insures savings. And the savings are continuous: "Featherweight" will last the life of your heating system!

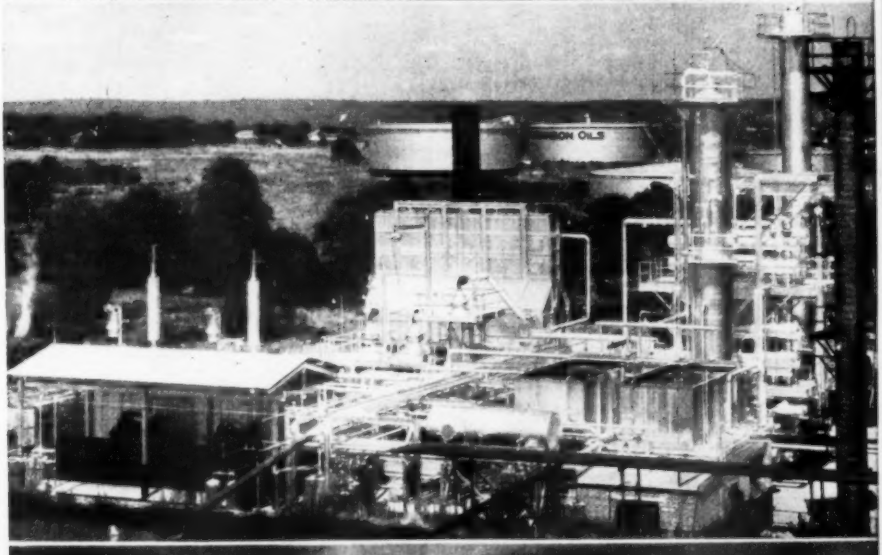
Keasbey & Mattison "Featherweight" 85% Magnesia Insulation is made in blocks, laggings, and standard-size pipe coverings for all applications up to 600° F. Other K&M Insulations cover service ranges from 40° F. to 1900° F. Our local distributor, who is an experienced applicator, will be glad to give you complete information. Or, write us.

Nature made Asbestos . . .
Keasbey & Mattison has made it serve mankind since 1873

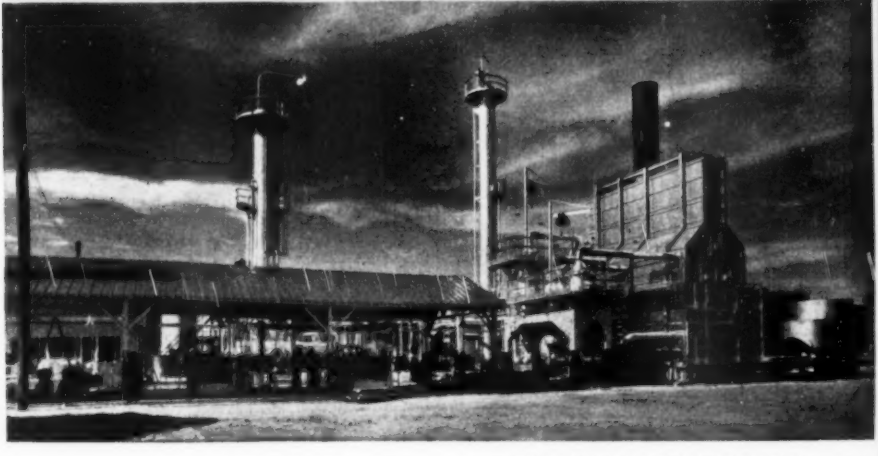
KEASBEY & MATTISON
COMPANY • AMBLER • PENNSYLVANIA



KENDALL REFINING CO.
Bradford, Pa.



JOHNSON OIL REFINING CO.
Cleveland, Okla.



MIDWEST REFINERIES, INC.
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NOW ON STREAM...
THREE NEW UOP
PLATFORMING UNITS

On stream in less than a year from the date the contracts were signed . . . the new Kendall, Johnson, and Midwest Platforming Units provide proof of Procon resources and skill.

Even though defense requirements presented definite problems, Procon was able to procure materials and equipment without serious delay . . . and having ample manpower and construction facilities available, quickly completed the jobs.

BUILT BY PROCON

Staffed and equipped to handle any process construction job, Procon offers a *complete service* to the petroleum refining and petro-chemical industries. If your plans call for new construction or expansion of existing facilities, discuss your requirements with Procon.

PROCON *Incorporated*

PROCESS CONSTRUCTION

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Here is *Exactly WHY* a V-Belt with CONCAVE SIDES Gives You *Longer Wear!*

What Happens When a V-Belt Bends

Straight-Sided V-Belt

Gates Vulco Rope with Concave Sides

How Straight-Sided V-Belt Bulges in Sheave-Groove. Sides Press Unevenly Against V-Pulley Causing Extra Wear At Point Shown by Arrows.

The Concave Sides Fill Out to a Precise Fit in the Sheave Groove. No Side Bulge! Sides Press Evenly Against the V-Pulley — Uniform Wear — Longer Life!

To see for yourself how a V-Belt that has *concave sides* is certain to give longer wear, just make this simple test:—

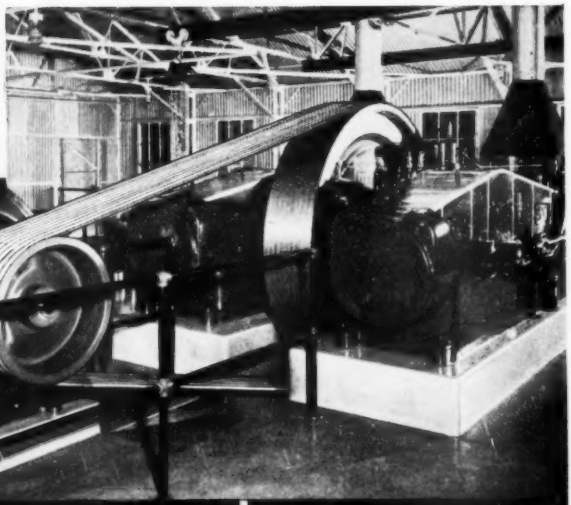
Pick up any V-Belt you have at hand. Bend that belt as it bends around a pulley. As it bends, grip its sides between your fingers. Here is what will happen *everytime*.

If the V-Belt you are testing has *straight sides*, you can feel those sides *bulge out* as the belt bends. This out-bulge forces the sides of the belt to press *unevenly* against the V-Pulley and you naturally get *concentrated* wear just where the bulge is greatest—as shown in figure 1-A, at left.

Now, make this same test with the belt that is built with *Concave Sides*—the Gates Vulco Rope!

Whereas you felt an *out-bulge* when you bent a belt with straight sides, you find that the *Concave Sides* merely fill out and become *perfectly straight*. The sides therefore *press evenly* against the V-Pulley. This distributes the wear *uniformly* across the *full width* of the belt. Naturally, this means longer belt life and *lower* belt costs for you!

Only V-Belts made by Gates are built with concave sides. Whenever you buy V-Belts, be sure that you get the V-Belt with the Concave Sides—The Gates Vulco Rope!



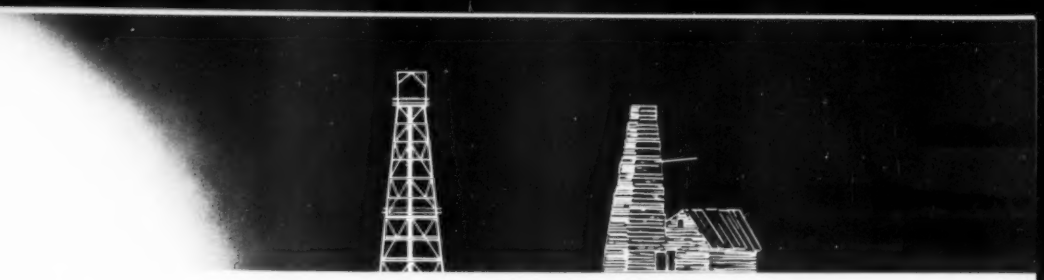
One of the 3 identical engine-alternator units in No. 18 Plant of the Sinclair Prairie Oil Company near Long View, Texas. The Gates Vulco Rope Drives operated for more than 43,000 hours before any repairs were necessary.

CS-517

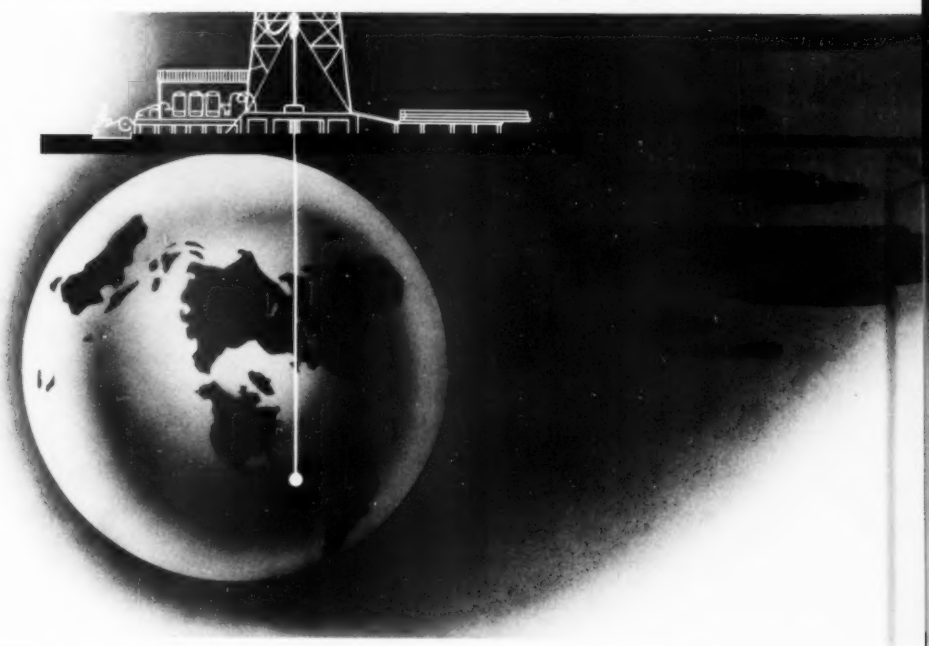
Gates
Hose V-Belts
Molded Rubber Goods
for Industry

VULCO ROPE DRIVES
ENGINEERING OFFICES AND JOBBER STOCKS
IN ALL INDUSTRIAL CENTERS

THE GATES RUBBER COMPANY
DENVER, U. S. A.
The World's Largest Makers of V-Belts



four score and twelve of oil progress



. . . now the wells are deeper and more distant

Lay the maps of the oil fields end to end and it's a long way around from Redwater, Alberta, to the Straits of Magellan to Kuwait and Sumatra. But since distance has never been a barrier to men who search for oil this four score and twelve of oil progress, with its estimated 4-billion barrel crude production for 1951, will soon be merely another milestone in the rapidly-expanding petroleum industry.

During the coming years of oil progress other great distances will be registered—distances deep down in the earth, passing present marks and even present objectives. As the drills penetrate deeper and deeper into new strata, and the search for oil is extended to new frontiers, there'll be demands for new and better machinery and more rugged drill pipe and casing to combat the natural forces encountered at any depth in any climate.

In the development and manufacture of these products National Supply will continue its role as the world's largest manufacturer and distributor of drilling and production equipment. Because its first obligation is to keep pace with the needs of the oil industry you'll always find everything that's new and everything that's standard at National Supply.

THE NATIONAL SUPPLY COMPANY

General Sales Offices: Toledo, Ohio

NATIONAL BLUE PRODUCTS

here's PROFITABLE PUMPING at

NATIONAL PUMPING UNITS
12 Basic Sizes, and
79 Standard Combinations Available

Engineered individually, every one of the National Pumping Units in the "National Blue" series is designed to perform under specified load requirements. National Pumping Units give long, trouble-free service in the field, under all conditions.

With 12 basic sizes and 79 standard combinations available in the "National Blue" Pumping Unit line, you can procure a National Pumping Unit virtually "tailored" to your requirements. API Beam Loading Ratings: 3200 to 32,400 pounds, with beam or crank counterweights.

Some of the advantages you get when you choose a National Pumping Unit include:

- **Jig-welded construction, reinforced at all extreme-stress points;**
- **Anti-friction, needle-type bearings at saddle, beam pitman and rein hanger for quiet operation and long life;**
- **Leveling on foundation simplified by provision for leveling screws on main base of the larger units;**
- **Gear reducers have herringbone gears (excepting D-3 size), magnetic drain plugs, sediment chambers and other details designed for ease of maintenance and quiet operation.**

Write for bulletins concerning the National Pumping Units you need, or get the information from your nearby National Supply Store.

NATIONAL OIL FIELD MACHINERY AND EQUIPMENT · SPANG STEEL PIPE ·

any depth

SHALLOW

National Pumping Unit representative of Series D-3 through D-7 for light to medium loads.

MEDIUM

Engineered for medium to heavy loads, this National Pumping Unit is typical of Units D-11 through D-15.

DEEP

National Supply's largest Pumping Unit, the D-32, has maximum 10-foot stroke, does heaviest work.

NATIONAL BLUE PRODUCTS

THE NATIONAL SUPPLY COMPANY

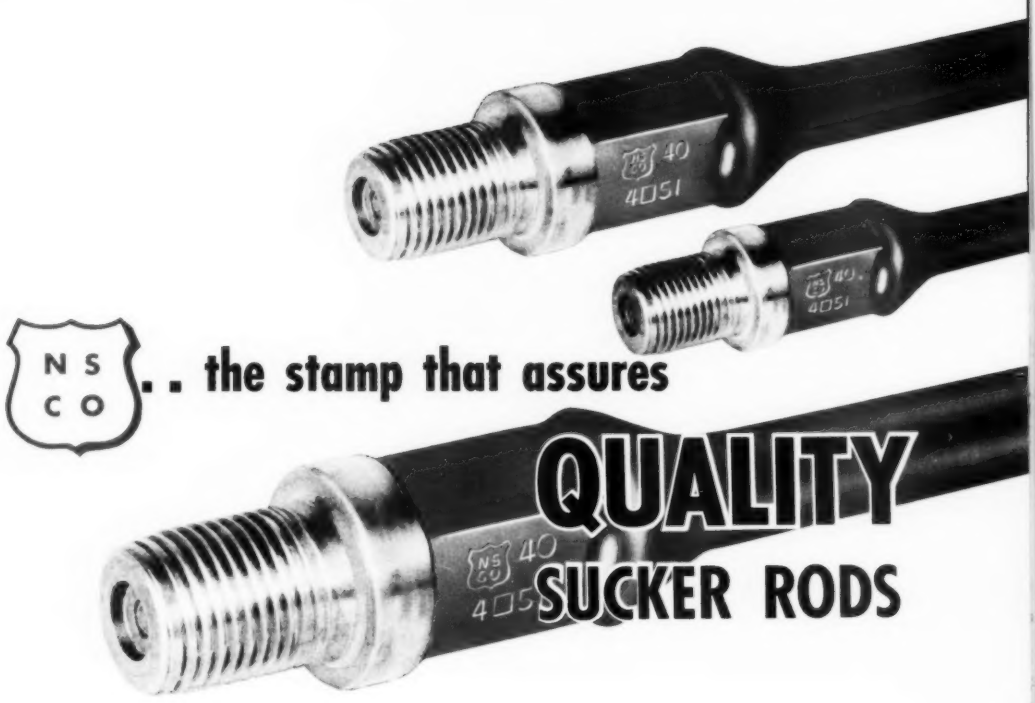
General Sales Offices: Toledo, Ohio

SUPERIOR & ATLAS ENGINES

Division Offices: Casper, Ft. Worth; Houston; Pittsburgh; Tulsa; Torrance

Canada: The National Supply Company, Limited, 702 Barron Building, 610 Eighth Avenue, West, Calgary, Alberta

Export: National Supply Export Corporation, 600 Fifth Avenue, New York 20, N.Y., U.S.A.; River Plate House, 12 South Place, London, E.C.2



NS CO .. the stamp that assures

QUALITY SUCKER RODS

National Supply uses specially-developed machines to forge, upset and thread the top-grade steels specified for National Sucker Rods . . . the Sucker Rods designed to give maximum service for the lowest cost under any pumping conditions.

The NSCO shield, stamped on every National Sucker Rod, is your assurance of engineered resistance to shock, corrosion, fatigue, and impulse loads.

For more information about National Sucker Rods, check with your nearby National Supply Store, or ask your National Supply representative.

THE NATIONAL SUPPLY COMPANY

GENERAL SALES OFFICES: TOLEDO, OHIO

DIVISION OFFICES: Casper, Ft. Worth, Houston, Pittsburgh, Tulsa, Torrance

CANADA: The National Supply Company, Limited, 702 Barron Building, 610 Eighth Avenue, West, Calgary, Alberta

EXPORT: National Supply Export Corporation, 600 Fifth Avenue, New York 20, N.Y., U.S.A., River Plate House, 12 South Place, London, E.C. 2

NATIONAL BLUE PRODUCTS

NATIONAL OIL FIELD MACHINERY AND EQUIPMENT · SPANG STEEL PIPE · SUPERIOR & ATLAS ENGINES

• In and out of Oil Fields • Laying Pipelines
• Transporting Power and Pumping Units
• Moving Tank Trucks

GENERALS

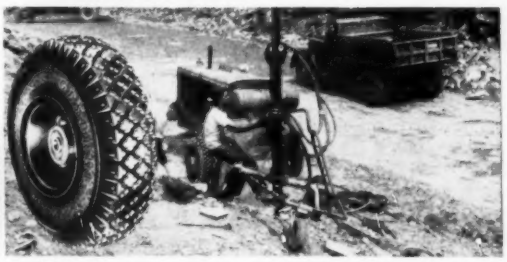
Do all Jobs

FASTER! EASIER! AT LOWER COST!

When jobs call for extra power and traction off-the-road, depend on the broad-lugged, deep-shouldered GENERAL L. C. M. Shock-absorber construction and more rayon cords per inch assure more strength, more original miles—more recap miles.

When jobs call for some work off-the-road, most on, use the GENERAL H. C. T. Extra thick saw-tooth tread for more traction, more high-speed safety. Tough shoulder cleats prevent snags, cuts, bruises. More original, more recap miles.

GENERAL C. D. Built for long runs over-the-road. More cords and more rubber for safer, lower cost miles.

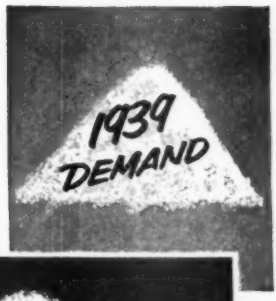


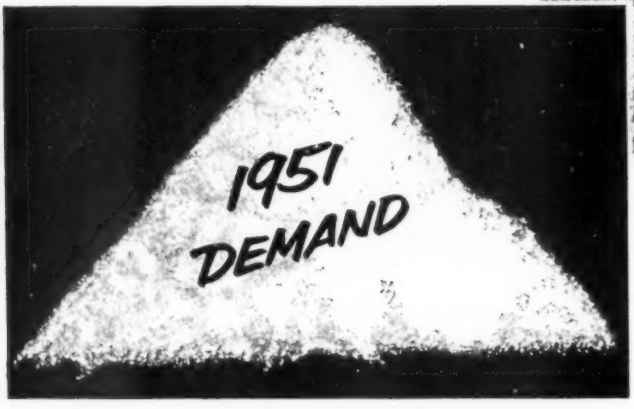
WIDE-BASE GENERAL INDUSTRIAL PNEUMATICS—Rugged small tires for drilling equipment. More flotation.

REQUEST GENERAL TIRES ON YOUR NEW EQUIPMENT

In spite of record output

Sulphur is SHORT





For the first time since World War I, sulphur is in short supply . . . a condition which promises to continue and to affect the products of many industries.

Commercial sulphur in quantity is just one advantage of this method for removing H_2S

SULPHUR IS A MARKETABLE and profitable side-product of the Shell Phosphate Process for dependable, low-cost removal of H_2S in the presence of large volumes of CO_2. Since the recovered H_2S is of relatively high concentration, it can be converted to solid sulphur or acid at very low cost.

This treating process has no harmful effect upon subsequent refining operations. The treating agent is inorganic . . . non-contaminating to hydrocarbons.

The Shell Phosphate Process is outstanding for its low operating costs. All but harmless amounts of H_2S are removed while most of the CO_2 is left untouched.

The Shell Phosphate Process is available to any operator under license from the Shell Development Company . . . together with experienced engineering service for its design, and operation.

SHELL DEVELOPMENT COMPANY

50 WEST 50TH STREET • NEW YORK 20, N. Y.

SHELL

IT'S RUBBER!

WHY CABOT IS THE PUMPING UNIT YOU WANT!

With one stroke Cabot has done away with 62 parts! How? Simply by using rubber for the evener bearing. Remember how auto spring shackle bolts used to wear and rattle before rubber replaced them?

Well, the whole Cabot Unit is as modern as tomorrow—simple, ingenious, a mile ahead.

Everybody who finds out about the Cabot wants one—or a dozen. You find whole fields studded with them.

If you think we're enthusiastic, ask a Cabot owner. Or, ask the men at your near-by Jones & Laughlin Supply store. They can tell you all about the Cabot Unit and just what more to expect of it on wells like yours.

AMERICA NEEDS SCRAP TO MAKE MORE STEEL

"... here's MY warehouse!"

Jones & Laughlin Supply Company

J&L STEEL

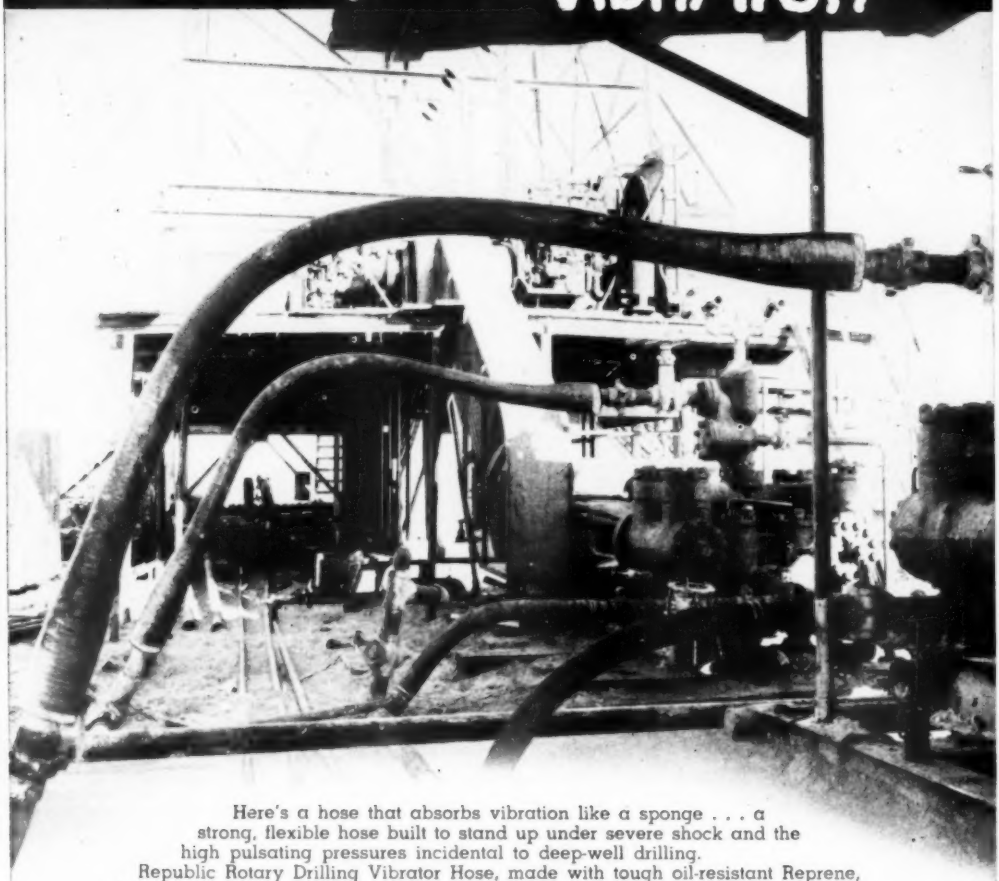
Subsidiary of Jones & Laughlin Steel Corporation

EXPORT: 405 Lexington Ave., New York, N. Y., U. S. A.

82 STORES • 17 OFFICES • 6 RESIDENT SALESMEN

General Offices: TULSA, OKLAHOMA

Republic ROTARY DRILLING VIBRATOR HOSE



Here's a hose that absorbs vibration like a sponge . . . a strong, flexible hose built to stand up under severe shock and the high pulsating pressures incidental to deep-well drilling.

Republic Rotary Drilling Vibrator Hose, made with tough oil-resistant Reprene, is highly resistant to abrasion and the deteriorating effect of oil.

Flexible steel muscles give Republic hose maximum resistance to pressure and protection against distortion. The patented Boltless Coupling, streamlined to the bore and shape of the hose, assures a leak-proof union and a snag-free hose.

Republic Rotary Drilling Vibrator Hose is supplied in standard 10, 12, 15, 20 and 25-ft. lengths complete with coupling. Every length is designed to withstand a test pressure up to 5,000 psi upon delivery. Contact your Republic Distributor or write direct for further information.

INDUSTRIAL RUBBER PRODUCTS BY

REPUBLIC RUBBER DIVISION

Lee Rubber & Tire Corporation

YOUNGSTOWN, OHIO

MID-CONTINENT DISTRIBUTORS

The Bovaird Supply Co. Tulsa, Okla.

Jones & Laughlin Supply Co. Tulsa, Okla.

WEST COAST DISTRIBUTORS

W. C. Hendrie & Co., Inc. 405 Towne Ave., Los Angeles, Calif.

Pacific Coast Rubber Co. 51 Main St., San Francisco, Calif.

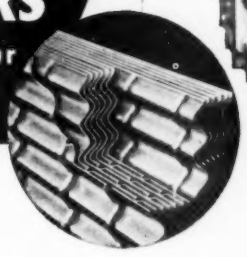
WHEN STORING FLAMMABLE LIQUIDS IT PAYS TO BE

EXTRA **Safe**

WITH "Varec"

FLAME ARRESTERS

in combination with your **VENT VALVES**



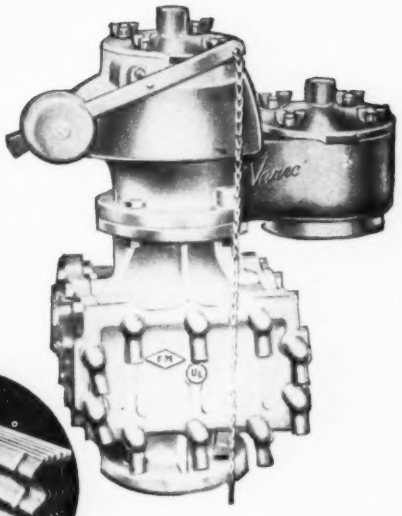


Fig. No. 5800A Conservation Vent unit consisting of "VAREC" Vent Valve in combination with VAREC Flame Arrester

The belief that conservation vents or breather valves alone will prevent travel of flame back into flammable liquid storage tanks is questionable because of the many contributing factors. Careful authoritative analysis reveals that valves by themselves do provide *some protection* but this "*protection*" *is by no means adequate* under all circumstances.

Safety authorities emphatically advise that "vent valves are not regarded as providing the required protection against fire and explosion." A textbook on safety states that "a conservative policy is to provide flame arresters in conjunction with other vent equipment on all cone-roof atmospheric tanks handling oils with a flash point up to 200° F. open cup."

"VAREC" Flame Arresters when used as a unit with "VAREC" Vent Valves give you full fire protection at extremely low cost. Average installations run approximately .1 of 1% of your investment in tank and products. Consult your nearest "VAREC" representative or write for further information.

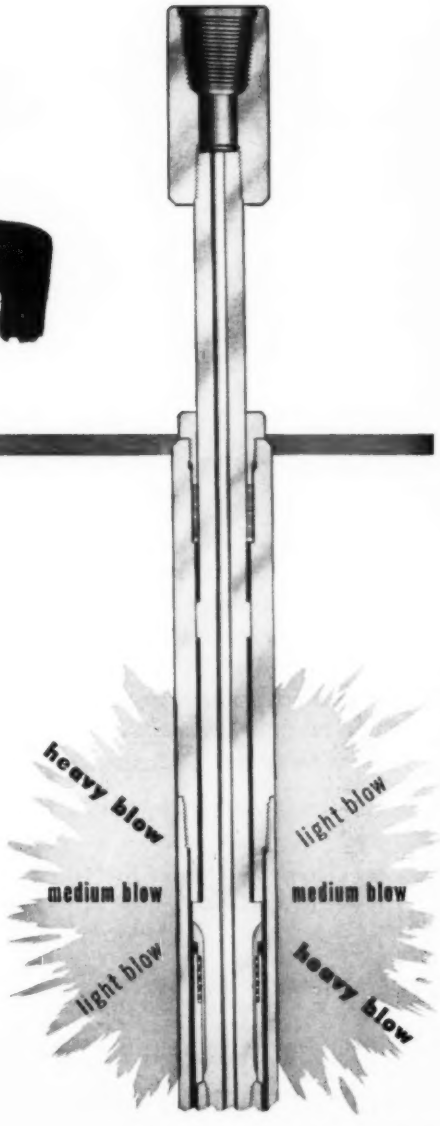
P-16

THE VAPOR RECOVERY SYSTEMS COMPANY
COMPTON, CALIFORNIA, U. S. A.
Cable Address: VAREC COMPTON USA (All Codes)
New York — Boston — Pittsburgh — Chicago — Detroit — St. Louis — Houston
Tulsa — Casper, Wyo. — Provo, Utah — Los Angeles — San Francisco — Seattle

PROVED and APPROVED "Varec"

Jarring Jerry

The right jar for the job at hand



THE JOHNSTON-SUTLIFF HYDRAULIC JAR

A Jar that hits any desired blow, at any time, to meet any condition—without pulling out of the hole.

Write For Descriptive Literature!

JOHNSTON

SHOOT • TEST

M. O. JOHNSTON OIL FIELD SERVICE CORPORATION
3035 Andrita Street — Los Angeles 65, California
"Servicing California & Rocky Mountains"

M. O. JOHNSTON OIL FIELD EXPORT CORPORATION
3035 Andrita Street — Los Angeles 65, California
"Exclusive Export Sales"

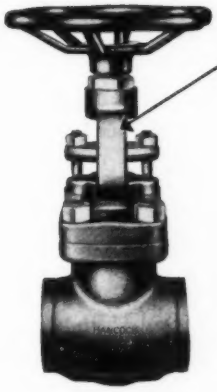
ANOTHER STAR IN THE HANCOCK LINE-UP!

NEW GENERAL PURPOSE

800# Hancock Gate

STEEL WELDVALVES

These new 800# Hancock General Purpose Steel Gate Weldvalves are the product of nearly three-quarters of a century of valve engineering and manufacturing experience. Built into them are exclusive design and operating features that assure extra years of top performance in the severest services.



800# HANCOCK STEEL GATE WELDVALVES

Bolted Bonnet Design

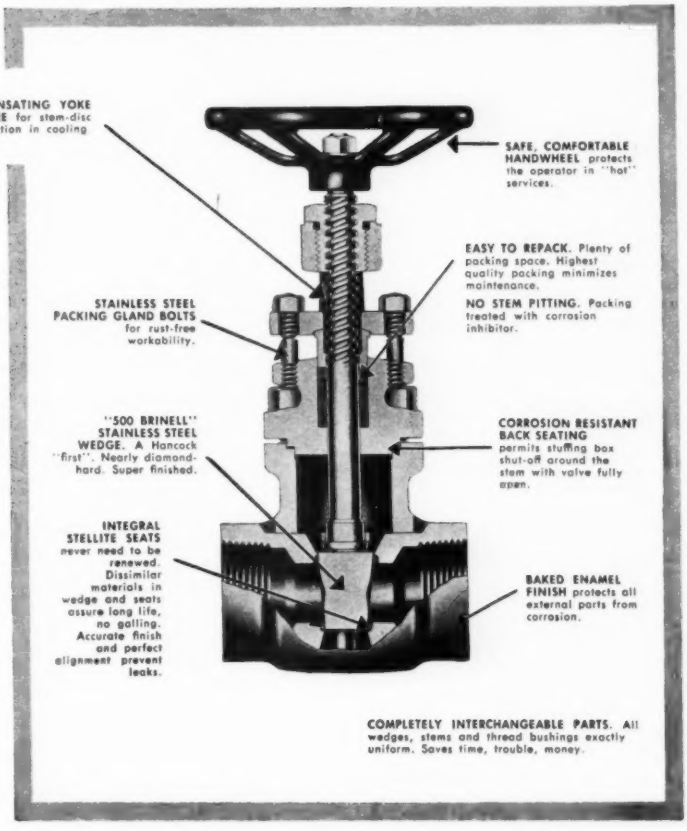
Sizes: 1¼" thru 2"

Screwed Ends . . . Socket Weld Ends . . . Flanged Ends

For *All* Pressures Up to 800 P.S.I. at 750° F.

O.W.G. 2000# 100° F.

General Purpose Hancock Steel Gate Weldvalves cost no more than ordinary valves — despite their recognized trouble-free dependability and long-life economy. Your nearby Hancock Valve Distrjbutor has the facilities and the stocks to give you fast, efficient service. Get the best for your money. Phone him.


COMPENSATING YOKE STRUCTURE for stem-disc contraction in cooling.
SAFE, COMFORTABLE HANDWHEEL protects the operator in "hot" services.
EASY TO REPACK. Plenty of packing space. Highest quality packing minimizes maintenance.
NO STEM PITTING. Packing treated with corrosion inhibitor.
STAINLESS STEEL PACKING GLAND BOLTS for rust-free workability.
"500 BRINELL" STAINLESS STEEL WEDGE. A Hancock "first". Nearly diamond-hard. Super finished.
CORROSION RESISTANT BACK SEATING permits stuffing box shut-off around the stem with valve fully open.
INTEGRAL STELLITE SEATS never need to be renewed. Dissimilar materials in wedge and seats assure long life, no galling. Accurate finish and perfect alignment prevent leaks.
BAKED ENAMEL FINISH protects all external parts from corrosion.
COMPLETELY INTERCHANGEABLE PARTS. All wedges, stems and thread bushings exactly uniform. Saves time, trouble, money.

1877 HANCOCK U.S.A.

When Hancocks go in, valve costs go down

HANCOCK VALVES

MAXWELL MANNING MM MOORE TRADE MARK

A product of **MANNING, MAXWELL & MOORE, INC** WATERTOWN 72, MASSACHUSETTS

MAKERS OF 'HANCOCK' VALVES, 'ASHCROFT' GAUGES, 'CONSOLIDATED' SAFETY AND RELIEF VALVES, 'AMERICAN' INDUSTRIAL INSTRUMENTS. BUILDERS OF "SHAW-BOX" CRANES, 'BUDGIT' AND 'LOAD LIFTER' HOISTS AND OTHER LIFTING SPECIALTIES.

A modern installation of a Condulet and rigid conduit system in a streamlined metal working plant. Type RSM Junction Condulets provide for easy expansion . . . branch circuits can be added at any time by simply removing knockout plugs.

... and tomorrow

A modern CONDULET* and rigid conduit installation gives you enduring protection

PLUS

the flexibility to meet tomorrow's needs

Type RSM Junction Condulets RS Series take 4 detachable hub plates with up to 3 hubs for conduit from ½" to 3½"

Type LFB Obround Condulet

Type LBB Obround Condulet

Type LL Obround Condulet

Type C Obround Condulet

Type U Obround Condulet

Type T Obround Condulet

Type BUF Mogul Condulet Mogul Series are for use where larger openings are needed for pulling large conductors

Type ARE Arktite Plug Receptacle

The most important consideration in an electrical installation is continuous plant operation through the years. Crouse-Hinds sturdy cast Feraloy CONDULETS and rigid conduit provide the best possible mechanical protection against accidental damage to electrical wiring and equipment.... prevent costly shutdowns.

Next in importance is flexibility to meet the needs of today's fast moving industry. A modern CONDULET installation provides for growth and changing conditions. CONDULETS with detachable hub plates make it easy to change circuits or add new ones at any time.

In addition to protection and flexibility, a CONDULET installation gives you these definite advantages:

- **ECONOMY.** The installed cost of Crouse-Hinds CONDULETS and rigid conduit compares favorably with other wiring methods. The added advantages make it the really economical method that pays dividends over the years.
- **SAFETY.** Ground continuity is of vital importance. CONDULETS with taper threaded hubs and rigid conduit with tapered threads make a secure joint that provides a reliable and permanent low resistance path to ground. This safety feature assures maximum protection against personal injury and fire.
- **CORROSION RESISTING.** Cast Feraloy CONDULETS give the best protection wherever moisture, dust, or corrosive atmospheres are present.
- **UNIVERSAL APPLICATION.** You can install galvanized CONDULETS and galvanized rigid conduit under all atmospheric conditions and in all occupancies.
- **QUALITY.** The trademark CONDULET stands for the highest quality, reliability, and long life.
- **VARIETY.** More than 15,000 items are listed in the CONDULET Catalog, including a complete explosion-proof and dust-tight line for use in hazardous locations.

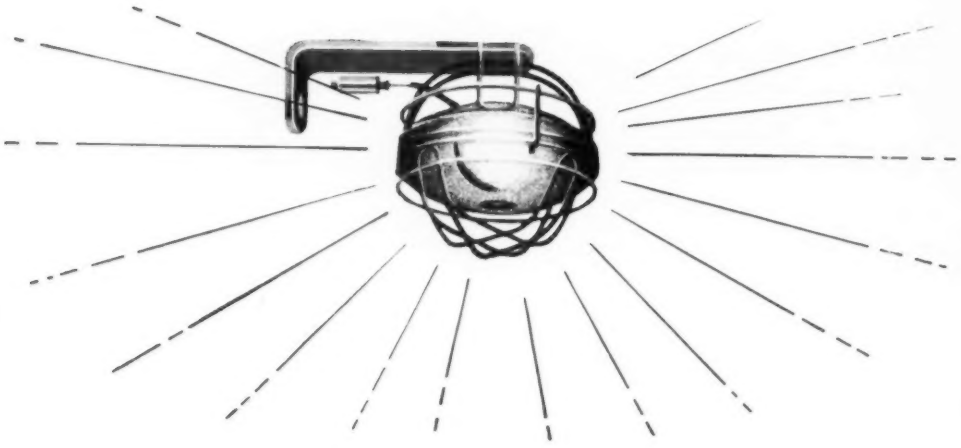
On YOUR next electrical layout, plan to get all the benefits of sturdy cast Feraloy CONDULETS and rigid conduit . . . the universal wiring method.

CROUSE-HINDS COMPANY
Syracuse 1, N. Y.

OFFICES: Albuquerque—Birmingham—Boston—Buffalo—Chicago—Cincinnati—Cleveland Dallas—Denver—Detroit—Houston—Indianapolis—Kansas City—Los Angeles—Milwaukee Minneapolis—New York—Philadelphia—Pittsburgh—Portland, Ore.—San Francisco Seattle—St. Louis—Washington. RESIDENT REPRESENTATIVES: Albany Atlanta—Baltimore—Charlotte—New Orleans—Richmond, Va.
Crouse-Hinds Company of Canada, Ltd., Toronto, Ont.

*CONDULETS are made only by CROUSE-HINDS

CONDULETS • TRAFFIC SIGNALS • AIRPORT LIGHTING • FLOODLIGHTS



THE FIRE WATCH THAT NEVER SLEEPS

ARE you ready for fire *when* it strikes? Week ends? Nights? During shut downs? Put a Kidde Automatic Fire Extinguisher System on the job—it's *always* on the alert against fire.

The heat from a fire hits the Kidde detector . . . sends a signal that releases flame-smothering carbon dioxide automatically. Such a system can protect a single space . . . or many spaces throughout the plant.

Wherever a hazard exists—in engine rooms, fuel storage rooms, document vaults, electrical equipment—you can depend on fire-sensitive, fast-acting Kidde automatic or manual systems to protect your property. Call on us for full information.

Kidde

Walter Kidde & Company, Inc., 1054 Main Street, Belleville 9, N. J.
Walter Kidde & Company of Canada, Ltd., Montreal, P. Q.

RAY-MAN ROTARY HOSE

Hose, V-belts, transmission belting, packing, engineered for all phases of the oil industry, are described in Catalog 6903. A copy will be mailed to you on request.

"You feel safer around this hose . . ."

That's the advantage of the Lip-Lok seal in the coupling – no blow-outs – the more pressure, the tighter the seal.

The built-in coupling also streamlines the hose end and helps make Ray-Man Rotary Hose last longer. No bands – no lugs – nothing to cause fouling and damage.

Flexibility in the hose adds to safety and long life. Write for Bulletin 6898 for more details on this hose-and-coupling value.

DISTRIBUTED BY NATIONAL SUPPLY COMPANY IN ALL PRINCIPAL OIL FIELDS

RM

MANHATTAN RUBBER DIVISION — PASSAIC, NEW JERSEY

RAYBESTOS-MANHATTAN, INC.

Manufacturers of Mechanical Rubber Products • Rubber Covered Equipment • Radiator Hose • Fan Belts • Brake Linings • Brake Blocks • Clutch Facings • Packings • Asbestos Textiles • Powdered Metal Products • Abrasive and Diamond Wheels • Bowling Balls

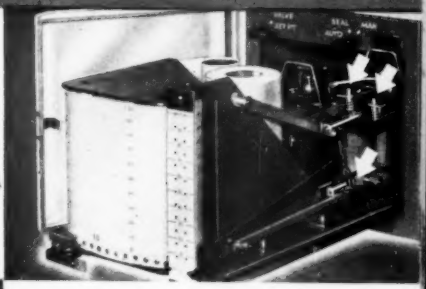
Important Contribution to

Introducing...

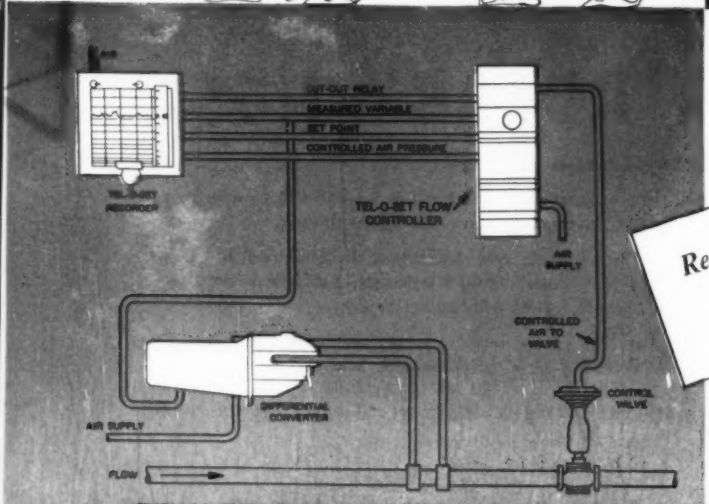
The New TEL-O-SET

8-hour chart visibility without interrupting operations

Built-in adjustable restrictions for pulsating flow



Right side of recorder, illustrating accessibility of zero and fine span adjustments.



TYPICAL ENGINEERED SYSTEM FOR FLOW

The Tel-O-Set Recorder pictured in this diagram is one unit of the family . . . each part designed and built as an engineered, integrated loop.

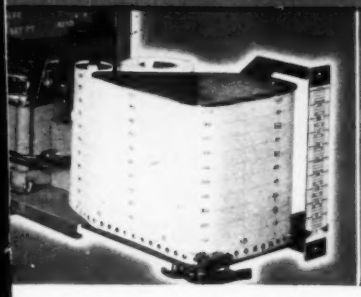
Requires very little panel space... no holes to drill

All adjustments made at front of panel

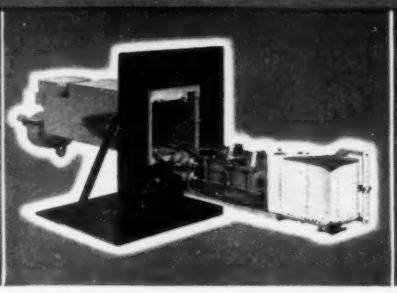
Process Control

RECORDER

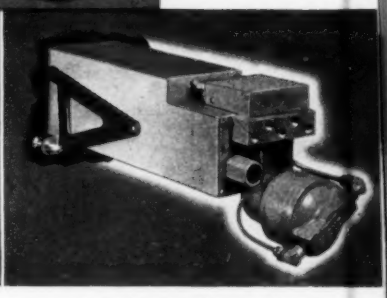
Front view showing transparent plastic cover. Knob at bottom is for adjustment of controller set point when on "automatic," and for regulation of air-to-valve pressure when on "manual." Panel space 5 1/16" high by 5" wide.



Left side of recorder with chassis partially withdrawn and held by safety catch. Note clearly visible 8-hour chart.



Safety catch released, chassis completely withdrawn from case. Air and electrical connections are still intact.



Rear view, showing one of the two detachable side mounting brackets with its single clamping screw.

The new *Tel-O-Set* Recorder, one of an integrated family of instruments, is used for recording such process variables as temperature, pressure, flow and liquid level. It also provides remote set-point adjustment and valve position indication.

Among the many advantages the *Tel-O-Set* Recorder offers are:

- EASE OF MAINTENANCE. Several models are available —all with interchangeable parts.
- ALL ADJUSTMENTS FROM FRONT OF PANEL. Chassis can be partially withdrawn. Zero, coarse and fine span adjustments, and restriction screws are accessible. Unit is in position for easy chart replacement and pen and ink service.
- FULL 8-HOUR CHART visible by sliding chassis only part way while instrument is still in operation.
- PILOT-OPERATED NON-DRIFT PRESSURE REGULATOR.
- BUMPLESS SHIFTING FROM AUTOMATIC TO MANUAL OPERATION.
- BUILT-IN ADJUSTABLE RESTRICTIONS FOR PULSATING FLOW.

For detailed information, write for Specification No. 769.

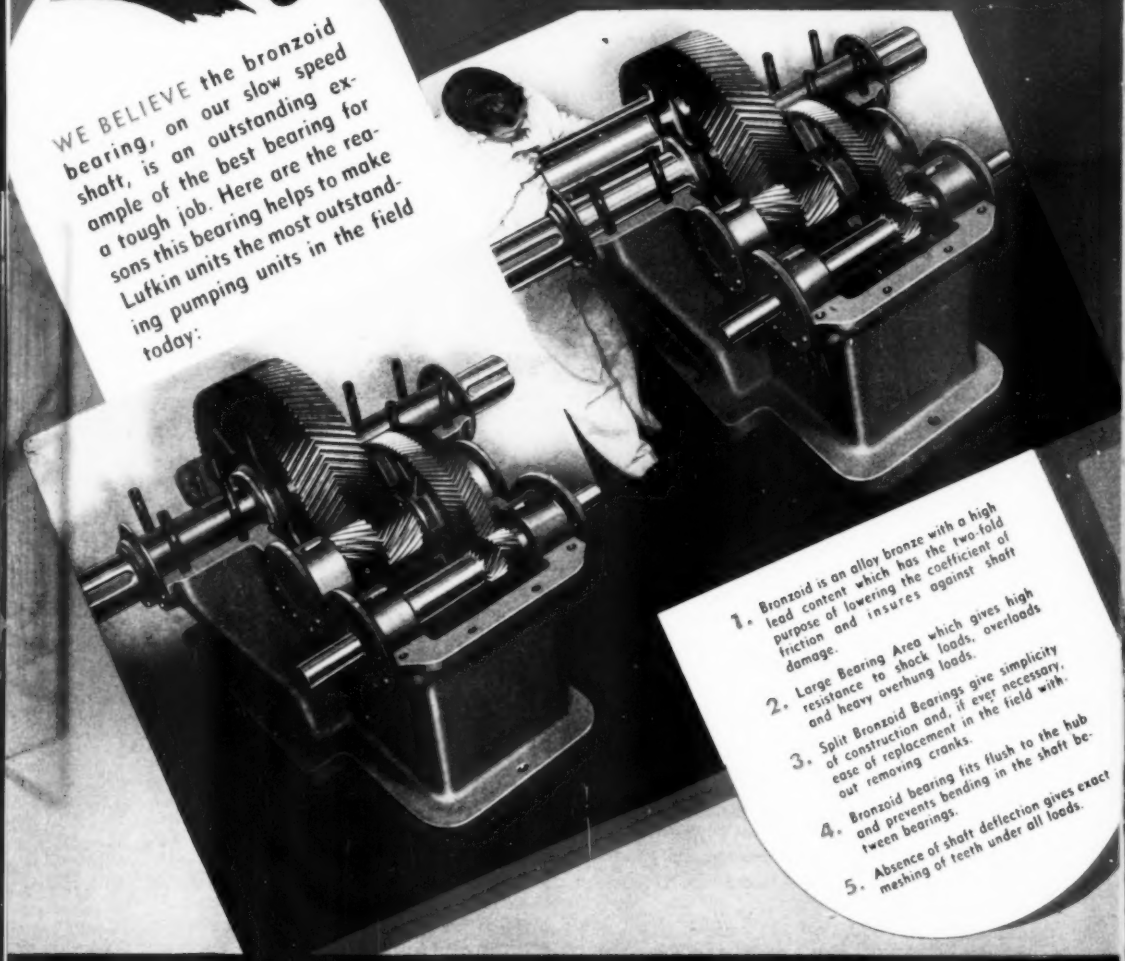
MINNEAPOLIS-HONEYWELL REGULATOR CO., *Industrial Division*, 4488 Wayne Ave., Philadelphia 44, Pa.

MINNEAPOLIS
Honeywell

Brown Instruments

Lufkin USES ONLY THE BEST In BEARINGS

WE BELIEVE the bronzoid bearing, on our slow speed shaft, is an outstanding example of the best bearing for a tough job. Here are the reasons this bearing helps to make Lufkin units the most outstanding pumping units in the field today:



1. Bronzoid is an alloy bronze with a high lead content which has the two-fold purpose of lowering the coefficient of friction and insures against shaft damage.
2. Large Bearing Area which gives high resistance to shock loads, overloads and heavy overhung loads.
3. Split Bronzoid Bearings give simplicity of construction and, if ever necessary, ease of replacement in the field without removing cranks.
4. Bronzoid bearing fits flush to the hub and prevents bending in the shaft between bearings.
5. Absence of shaft deflection gives exact meshing of teeth under all loads.

LUFKIN FOUNDRY & MACHINE COMPANY

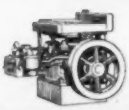
LUFKIN, TEXAS

Branch sales and service Houston, Dallas, New York, Tulsa, Los Angeles, Seminole, Oklahoma City, Corpus Christi, Odessa, Kilgore, Wichita Falls, Casper, Wyoming; Great Bend, Kansas.

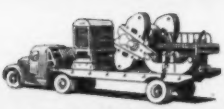
Lufkin Equipment in CANADA is handled by

THE LUFKIN MACHINE CO., LTD. 14321 108th Avenue, Edmonton, Alberta, Canada.

LUFKIN PUMPING UNITS



LUFKIN-COOPER-BESSEMER ENGINES



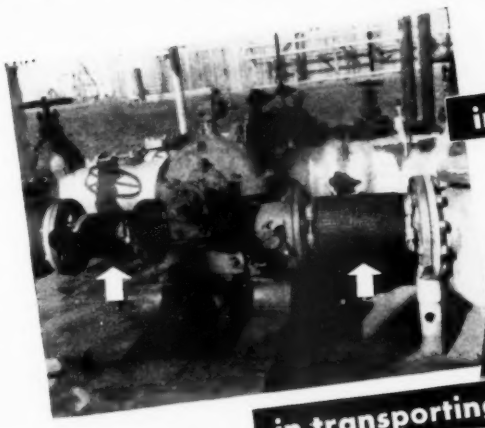
LUFKIN OIL FIELD AND INDUSTRIAL TRUCK TRAILERS

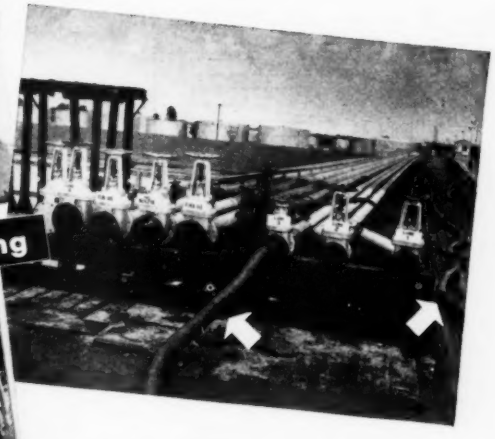
INDUSTRIAL SPEED REDUCERS AND INCREASERS

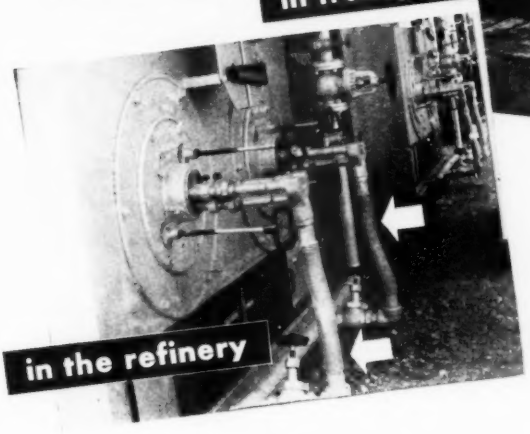
DIVISION LUFKIN FOUNDRY & MACHINE COMPANY INDUSTRIAL, MILL AND AUTOMOTIVE SUPPLIES

Let CMH FLEXIBLE METAL HOSE

take the motion . . .







and your equipment *will last longer!*

In all types of connections subject to vibration, misalignment, flexation or expansion and contraction, CMH Flexible Metal Hose will solve the problem economically and dependably . . . and in most cases, it will simplify piping hook-ups and make them easier to assemble and dissemble. Your equipment will last longer, too, if CMH Flexible Metal Hose is used to absorb the damaging effects of motion in rigid assemblies or to relieve the stresses of misalignment.

There is a CMH hose type or standard assembly to meet virtually every need. CMH distributors, located in principal cities, will be pleased to give you full information . . . see your classified telephone directory or write for literature.

REX-WELD corrugated steel and bronze hose is available in standard sizes from ¾" through 12" I.D. for burst pressures to 12,000 psi, temperatures to 1000° F. Stainless steel types also available.

REX-TUBE convoluted hose is available in a variety of types including square locked, ball bearing and fully interlocked in a variety of metals including steel, bronze and other alloys.

Flexon identifies CMH products that have served industry for over 49 years.

CHICAGO METAL HOSE Corporation

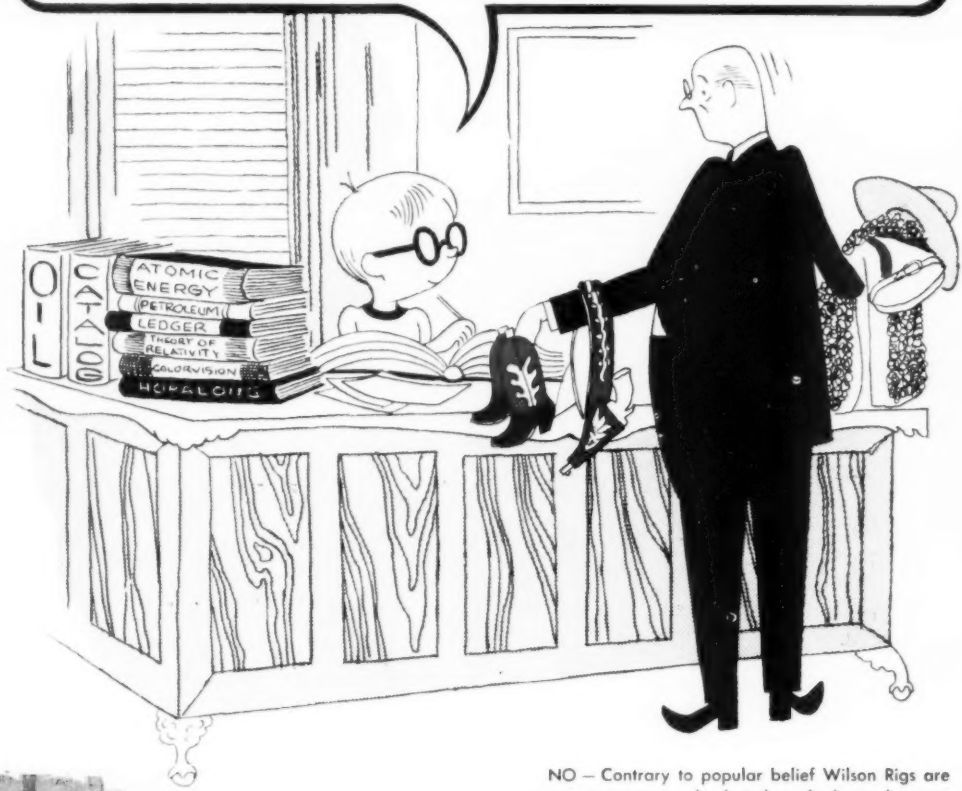
1345 S. Third Ave. • Maywood, Ill. • Plants at Maywood, Elgin, Rock Falls, and Savanna, Ill.
In Canada: Canadian Metal Hose Co., Ltd., Brampton, Ont.

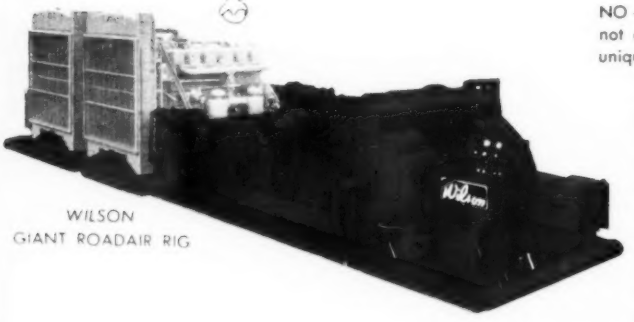
CMH

ONE DEPENDABLE SOURCE
for every flexible metal hose requirement

Convoluted and Corrugated Flexible Metal Hose in a Variety of Metals • Expansion Joints for Piping Systems
Stainless Steel and Brass Bellows • Flexible Metal Conduit and Armor • Assemblies of These Components

"Having carefully ascertained the emoluments arising from efficient operation of a Wilson Rig, I prefer a Giant Roadair rather than the fleeting make-believe of a new cowboy regalia."





WILSON
GIANT ROADAIR RIG

NO — Contrary to popular belief Wilson Rigs are not atom powered — but they do have the most unique features to be found in drilling rigs, such as:

- Optional Torque Converter Drives
- Four Friction Clutch Speeds to Drum
- Air - Tube Disc Clutches on All Drives
- Box-Type Oil Bath Compounds
- Rigid Alignment of Engine and Compound
- No Flexible Coupling needed between Engine and Compound

Because of these Big Features, Drilling Contractors find Wilson Rigs the finest and most economical to operate.

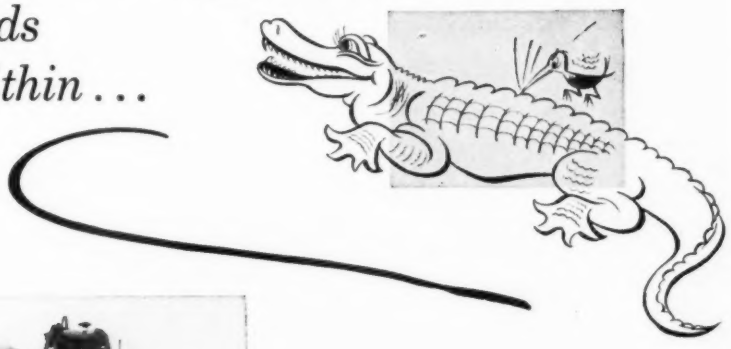
Compare Quality - Compare Prices

Wilson

MANUFACTURING CO., Inc.

WICHITA FALLS, TEXAS

Like the 'Gator's tough skin that shields what's within . . .



Johns-Manville Asbestos Felts shield oil and gas pipelines

Johns-Manville Asbestos Pipeline Felt—*the only type of wrapper that has survived more than 50 years of service in all types of soil*—now protects more than 100,000 miles of oil and gas pipelines!

A sturdy, inorganic product, Johns-Manville Asbestos Felt resists rot and decay, stands up in both acid and alkali soils. It has the thickness and toughness needed to shield pipeline enamels from earth load and soil stresses. And it permits the protective enamel coating to properly function against corrosion.

Johns-Manville Asbestos Felt is flexible; wraps easily without cracking. It guards enamel from impact damage both during installation of field-wrapped pipe, and during transportation and installation of mill-wrapped pipe.

There are important economic advantages, too! In addition to reducing maintenance expense, Johns-Manville Asbestos Felt adds many years of life to the pipeline. For further information and a sample of Johns-Manville Asbestos Pipeline Felt, mail the coupon below.

Johns-Manville
Asbestos
PIPELINE FELT

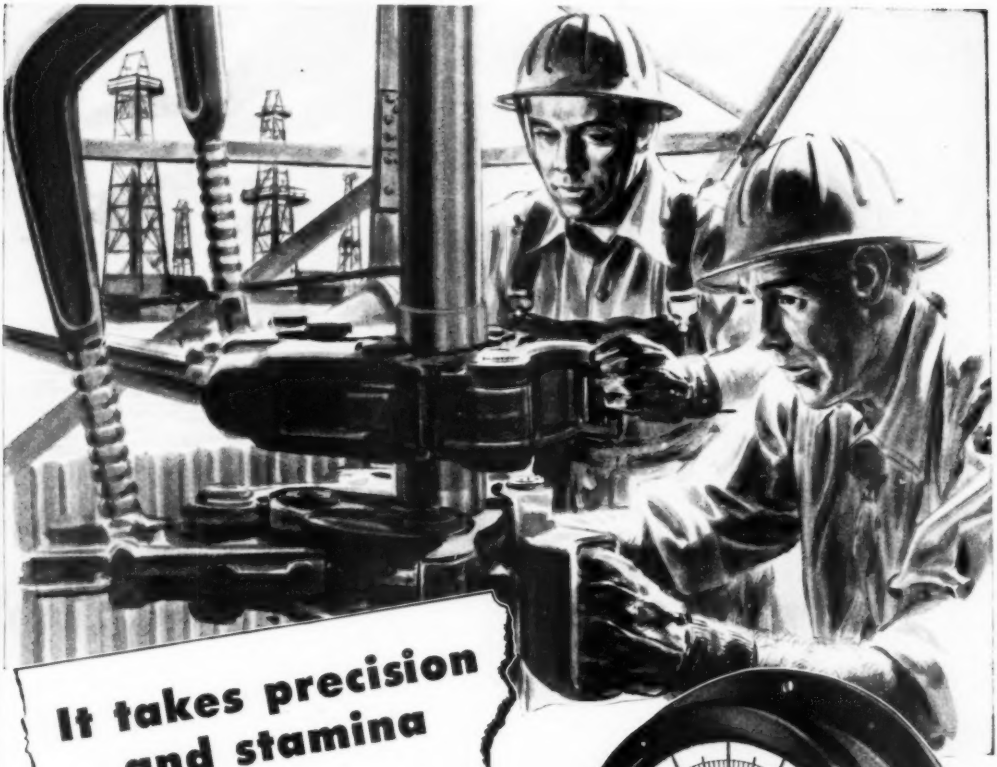
Johns-Manville
Box 290, New York 16, N. Y.

Please send me a copy of the sample folder on Johns-Manville Asbestos Pipeline Felt, PP-22A.

Name_____

Address_____

City_____ Zone____ State_____



It takes precision and stamina

On the rig it takes men who can team up and stand up — men who combine precision and stamina. In fact, any real job for a man or a machine in the oil country demands those same two qualities of precision and stamina.

Marsh instruments possess these qualities beyond all others. Proof of this is found in the performance records of the thousands of Marsh gauges used in every phase of the petroleum industry.

Product of the finest instrument plant and the greatest instrument experience, there is a Marsh gauge that will maintain its accuracy under any extreme of pressure, heat, pulsation or vibration.

Ask your local supply store or write us for facts about Marsh Gauges and dial thermometers for your requirements.

MARSH INSTRUMENT CO. *Sales affiliate of Jas. P. Marsh Corporation*

Dept. L, Skokie, Ill. Houston Branch Plant: 1121 Rothwell St., Sect. 15, Houston, Tex.

MARSH MASTERGAUGE

. . . all purpose gauge for most exacting applications — guaranteed accurate within ½ of 1% of reading. The Mastergauge is standard bearer of highest quality gauges specially adapted to every service. Latest Marsh development is new Christmas Tree gauge.

The Marsh Branch Plant at Houston manufacturing Marsh instruments right in the oil country, assures prompt service through your local supply store, also provides complete facilities for servicing all makes of gauges and dial thermometers.

MARSH GAUGES

Like the Motto of General Nathan Bedford Forrest

MAGCOBAR DEALERS

"GIT THERE FUSTEST WITH THE MOSTEST"

Your Magcobar Dealer keeps ample stocks on hand at all times and maintains a fleet of delivery trucks to give you 'round the clock service. Their motto . . . like that of General Nathan Bedford Forrest . . . is to "git there fustest with the mostest."

Many times this fast Magcobar delivery service has prevented blowouts which would have resulted in loss of life, caused serious property damage and a waste of vital natural resources. When you need mud, be sure to call your Magcobar Dealer. There are more than 300 Magcobar Dealers strategically located to give fast service throughout the oil country.

Magcobar
Complete
DRILLING MUD SERVICE
DEALER

- MAGCOBAR
- MAGCOGEL
- HIGH YIELD
- MAGCO-FIBER
- XACT CLAY
- FIBER SEAL
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- MAGCO-PHOS
- RED OX
- MAGCO-MICA
- TANNATHIN
- JEL-OIL MUD
- JEL-OIL "E"
- "E" CONCENTRATE
- NOHEEVE
- SEAL FLAKES
- MY-LO-JEL PRESERVATIVE
- QUEBRACHO
- CHEMICALS

Write today for your free copy of the booklet, "Magcobar Service . . . in tune with industry needs."

MAGNET COVE BARIUM CORPORATION

ONE OF THE DRESSER INDUSTRIES

MALVERN, ARKANSAS • HOUSTON, TEXAS

consider this OUTSTANDING ADVANTAGE of the famous WHELAND SWIVEL

WASH PIPE, special nickel alloy steel, carburized, precision machined, wearing surface heat treated to 700 Brinnell hardness, precision ground, polished and honed for maximum smoothness and minimum packing wear. Wash pipe outside diameters are precision machined in one operation assuring perfect concentricity and perfect alignment. No place to form pockets or restrict mud flow.

Wash pipes can be replaced with minimum time and effort. With just average care, the replacement goes in EASILY and in PERFECT ALIGNMENT.

ALSO IMPORTANT: Pressure lubricated, chevron type, controlled stack height, wash pipe packing in extra deep stuffing box. Free flexing packing lips provide positive mud seal. Triple lower grease seal. All packings permanently adjusted, pressure grease lubricated through readily accessible fittings.

All bearings have capacity in excess of Wheland's capacity ratings. Timken main load bearing with radial and thrust above and below to maintain perfect stem alignment. Upper thrust bearing, tapered cone. All bearings positively sealed off from mud and run in circulated, cooled oil. Large oil capacity.

Long radius gooseneck, streamlined manganese vanadium steel body, positive lower grease seal, special hold down construction, freedom from adjustments.

4 WHELAND SWIVEL SIZES

Model E-7000—Capacity 464,300 lbs. at 100 R.P.M.
Model E-6600—Capacity 350,000 lbs. at 100 R.P.M.
Model E-6200—Capacity 262,000 lbs. at 100 R.P.M.
Model E-6100—Capacity 130,000 lbs. at 100 R.P.M.

Bulletin No. 173 sent on request gives details, shows why more and more people are saying: "WHELAND has the best swivel on the Market."

WHELAND

THE WHELAND COMPANY, CHATTANOOGA, TENN., U. S. A.
ROTARY DRILLING MACHINERY

DRAWWORKS • SLUSH PUMPS
ROTARIES • CROWN BLOCKS
TRAVELING BLOCKS • SWIVELS

DOMESTIC DISTRIBUTORS & THEIR HEADQUARTERS: Jones & Laughlin Supply Co., Tulsa, Oklahoma • Houston Oil Field Material Co., Inc., Houston, Texas
Iverson Supply Co., Tulsa, Oklahoma • Lucey Products Corporation, Tulsa, Oklahoma • Superior Iron Works & Supply Co., Inc., Shreveport, Louisiana
EXPORT DISTRIBUTOR: Lucey Export Corporation, 233 Broadway, New York 7, New York — Broad Street House, London E. C. 2, England

ONE OF SEVEN

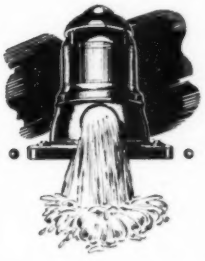
Big Producers

AT KEY WEST, FLORIDA

Seven Layne Well Water Supply units, each testing around 8,000 gallons per minute, have been installed to furnish cooling water for a power project at Key West, Florida. Permanent installations will be Layne Vertical Turbine type Pumps, each having a capacity of 2,300 gallons per minute. Preliminary tests indicate that efficiency will be much higher than promised.

Layne's method of designing, building and installing well water supply units is fully proven in higher production and lower operation cost. All installations are by Layne's own field crews and the work, from start to finish, is under the constant supervision of Layne engineers. Thoroughly tested before final delivery, Layne wells and pumps provide the utmost in dependability and long life. For further information, catalogs, bulletins, etc., address

LAYNE & BOWLER, INC.
General Offices, Memphis 8, Tenn.



WELL WATER SYSTEMS

• For Cities,
• Factories
and Plants of all Kinds

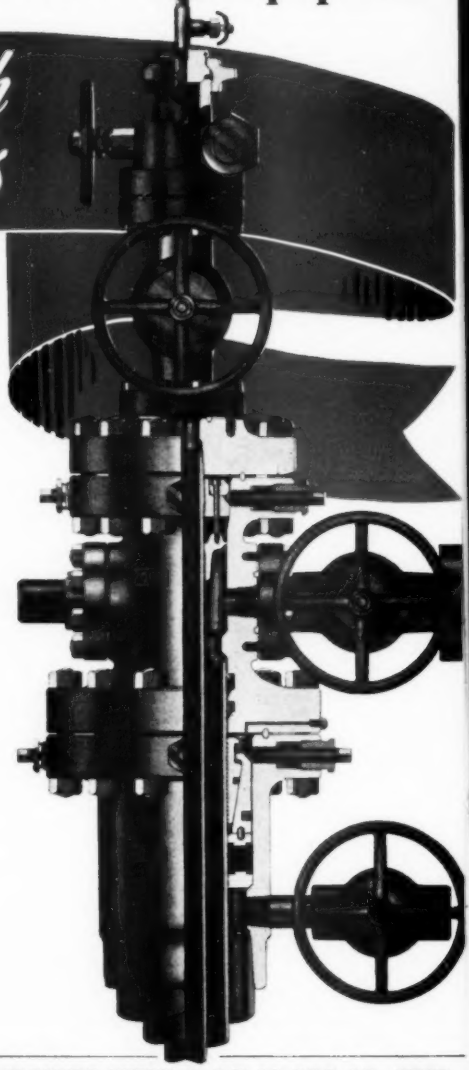
Layne contracts for and builds complete well water supply systems of any size or capacity and for any need such as cities, factories, ice plants, packing houses, paper mills, railroads, pipe lines, petroleum refineries, chemical plants, air fields, irrigation farming and many other places where big quantities of well water must be obtained at low cost.

Layne
WATER SUPPLY
WELLS & PUMPS

SINCE 1927

When the Oil Industry Needed Safer Equipment

O-C-T pioneered high pressure controls



During the years O-C-T has served the oil industry, we have felt a responsibility to be ready with equipment to meet **future needs** as well as dependable equipment to meet the every-day needs at hand.

As a result of this program of continuous research and development, Oil Center Tool Company gave the industry its first 10,000 lb. tree . . . **and** its first 15,000 lb. test tree.

With the expanded search for new and deeper oil reservoirs, pressures and depths will be encountered which will place other new demands on equipment. In anticipation of these future needs, O-C-T has again stepped up its program of research and development. So, when stronger, higher pressure controls are needed, O-C-T will have the equipment required for your operations.

On your next well . . . on wells of any depth or pressure . . . take advantage of the added strength, safety, convenience and flexibility provided by dependable O-C-T products. They have been engineered and manufactured to help you drill for and produce oil with economy and greater safety. Ask your O-C-T Representative or write for details.

OIL CENTER TOOL CO.

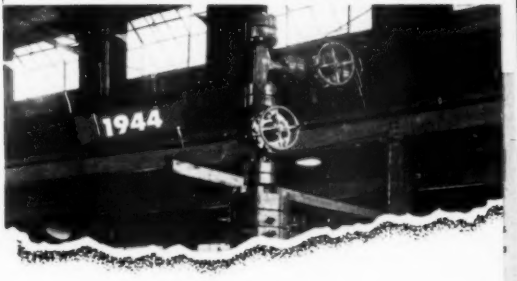
P. O. BOX 3091 • HOUSTON, TEXAS

Canada — Canadian-Vickers, Montreal Canada.
Sterling Areas — Le Grand, Sutcliff & Gell, Ltd., Southall Middlesex, England.
Address Export Inquiries for **All Other Countries** to P. O. Box 3091, Houston 1, Texas

When the industry demanded 10,000* TEST PRESSURE EQUIPMENT, O-C-T *was first to provide it — at Cotton Valley, for example*

O-C-T PRODUCTS HAVE PROVED DEPENDABLE ON THE WORLD'S DEEPEST WELL—ON THE WORLD'S HIGHEST PRESSURE WELL

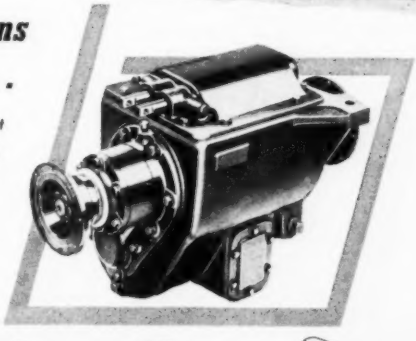
CROWDS VIEW O-C-T 15,000 LB. TEST CHRISTMAS TREE—WORLD'S FIRST!



Free your Trucks FROM THE FETTERS OF TOO FEW GEARS

Use Spicer Auxiliary Transmissions to assure lower cost per ton mile . . .

With a Spicer 3-Speed Auxiliary, you secure a *more efficient* delivery of pulling power, at a *more* efficient operating speed, than with any other combination of gears. Your truck runs easier, faster; with less fuel, lower depreciation; and at reduced maintenance costs. Driver cost per trip is cut; and there's less overtime. Spicer Engineers are experienced in every field of truck operation, and can help reduce your cost per ton mile.



47 YEARS OF Spicer SERVICE

SPICER MANUFACTURING • *Division of Dana Corporation*
TOLEDO 1, OHIO

TRANSMISSIONS
TORQUE CONVERTERS

PASSENGER CAR AXLES • CLUTCHES • PARISH FRAMES • STAMPINGS • FORGINGS
UNIVERSAL JOINTS • SPICER "BROWN-LIPE" GEAR BOXES • RAILWAY GENERATOR DRIVES

From HEAD to SHOE

Back pressure valve connected to top [illegible]g.

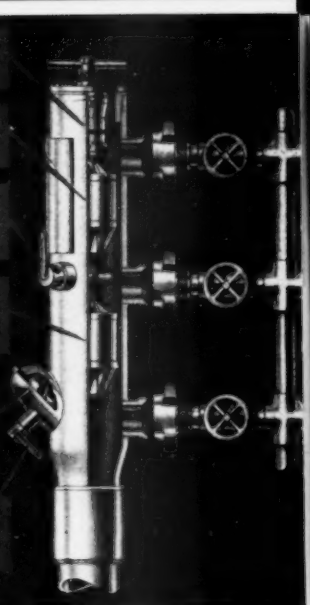
Top plug rides cement column down the casing.

Plug bar releases bottom plug without shutting down or opening head.

Bottom plug leads cement column and wipes casing clean of mud.

Trip ball that ejects float assembly in shoe to provide full casing-bore discharge.

Ball dropper releases trip ball without opening head.



RECTOR FULBORE CEMENTING METHOD

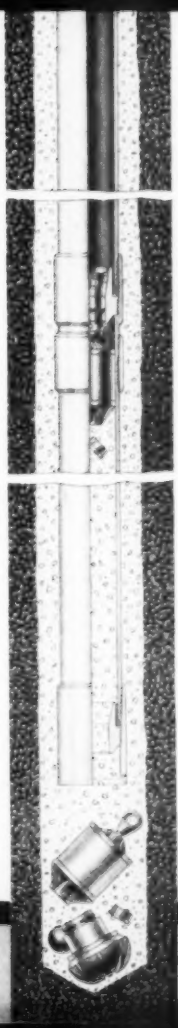
prevents contamination of cement

Every operator knows that voids caused by air pockets in the cementing string or soft spots due to contamination are the perfect set-up for future trouble. Prevention of these weaknesses is the basis of "Fulbore" cementing superiority . . . the assurance of a master cementing job, everytime.

The "Fulbore" multiple inlet head provides a closed circuit from beginning to end of cementing operations. The two plugs, made up in the head before it is connected to the casing string, are released mechanically without downtime. the plugs completely and effectively segregate the cement from the time it enters the head until discharged at the shoe. There is no possibility of contamination or the formation of air pockets.

Extreme simplicity is another advantage of "Fulbore" cementing. There are no discs to break . . . no small orifices through which the cement must be pumped. Traveling ahead of the cement, the bottom plug is pumped out of the casing through the float shoe from which the float assembly has been ejected after cementing string has been floated into position. This provides full casing discharge capacity . . . reduces the load on the pumps . . . permits greater volume to be circulated with same pump discharge pressure . . . results in higher velocity in space between casing and bottom of hole.

Every phase of "Fulbore" cementing is planned to make every job a master cementing job. Ask your Rector Representative or authorized supply store for full information about "Fulbore" Cementing and equipment.



RECTOR WELL EQUIPMENT COMPANY INC

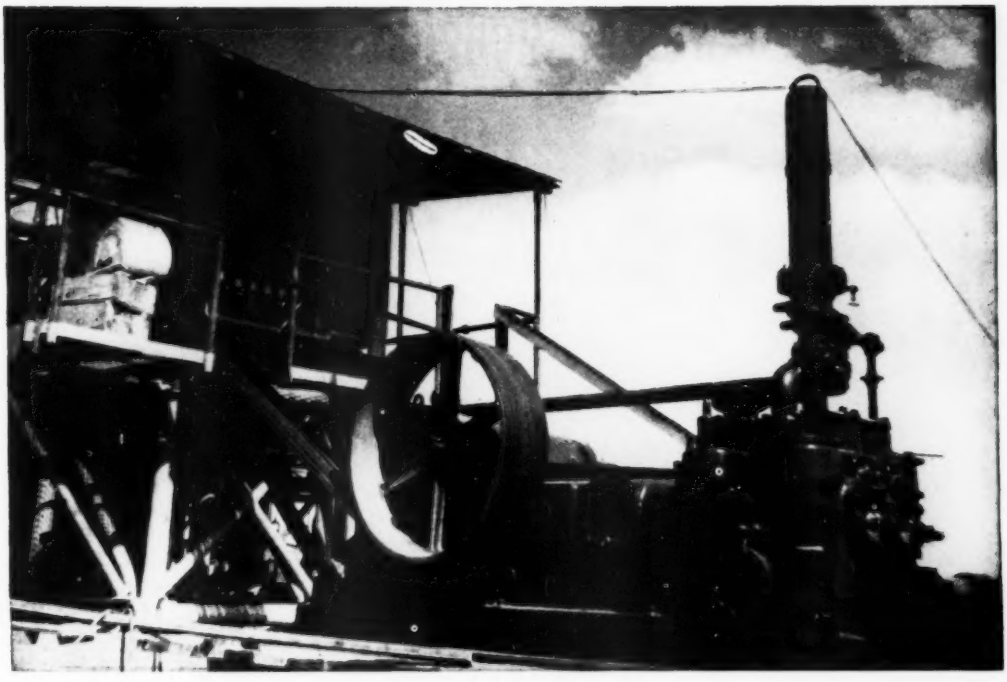
★ MAKING THE OIL INDUSTRY SAFER ★

1100 NORTH COMMERCE ST. FORT WORTH, TEXAS

Houston Plant: 2215 Commerce St.

REPRESENTATIVES IN ALL ACTIVE FIELDS

RECTORHEAD RECTOR FULBORE CEMENTING METHOD RECTORSEAL



This is the Drive the Production Men Wanted ...They Got It...Now Everybody Prefers It

It was the demand of the oil production men for a sheave like this that gave the QD sheave its start.

Now it's the most widely used hub-and-rim combination . . . in *all* industries.

Why does the Worthington QD satisfy the man in the oil fields?

Because it's *stronger*. Each size is designed for the load it has to carry—rather than proportioned for various sizes from one standard design.

Because it's *easier*. Easy to *get on*—split hub is clamped to shaft, heavier taper-bored rim slides easily over tapered hub. Easy to *get off*—long pull-up bolts are used as jack screws to remove the rim; hub stays put, no realignment problem.

Because it's always *tight* on the shaft. The friction cone grip of rim on hub makes a positive press fit on the shaft.

And because it's quickly *available*. Local distributor stocks all over the Southwest and other oil field areas, are backed by factory stocks in Los Angeles, Fort Worth, Houston, Tulsa, and New Orleans.

Standardize on Worthington Multi-V-Drive, with the original tapered cone grip sheave. Worthington Pump and Machinery Corp., Multi-V-Drive Sales Division, Buffalo, N. Y.

MV.1.10

QD

*Trade Mark

Most widely used hub-and-rim sheave

WORTHINGTON

THE GOOD RIGHT HAND OF INDUSTRY

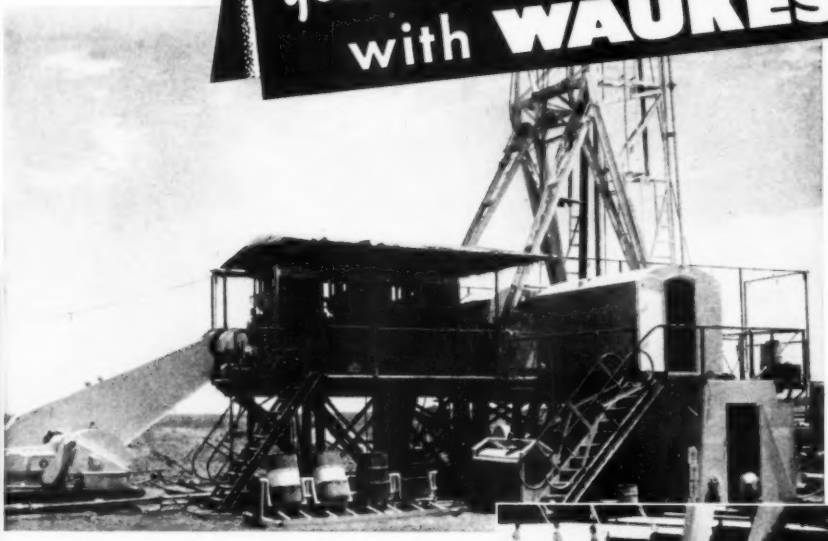
POWER TRANSMISSION: sheaves, V-belts, variable speed drives

PUMPS: centrifugal, power rotary, steam

AIR COMPRESSORS: water-cooled, air-cooled

NEW lighter-weight 3-engine rig

gets more drilling power with WAUKESHA



Robinson Drilling Co., in West Texas, using the Waukesha-powered new Model O Cardwell three-engine rig.

WAUKESHA MODEL 6-NKU POWER UNITS

Six cyl., 7-in. x 8½-in., 1962 cu. in. displacement; each 225 peak hp. at 1050 rpm., or 173 hp. continuously at 950 rpm., on natural gas or butane. The three of these units, which power the Robinson Drilling Co. rig, are shown in both pictures.

...DRILLS TO 10,000 FEET WITH 4½-INCH DRILL PIPE

It is Waukesha-powered for capacity—the new *Cardwell* Model O three-engine draw works. Two drilling line speeds ... instantly available ... for each of the three speed ratios in the transmission—are provided by two air disc friction clutches in the drum. And the three Model 6-NKU Waukesha Gas Power Units are instantly responsive, fast and flexible ... with that reassuringly ready reliability that means extra power for the pinches.

Larger in power, but lighter in weight, this new rig saves you money in moving as well as in drilling. Its owners, the Robinson Drilling Co., are long-long-time users of Waukesha-powered Cardwell rigs, having drilled with 'em everywhere from Illinois to West Texas, where this one is. Naturally the rig's Kohler light plant has a Waukesha Engine, too. *Get Bulletins 1079 and 1408.*

WAUKESHA MOTOR COMPANY, WAUKESHA, WIS.

NEW YORK • TULSA • LOS ANGELES

105

WAUKESHA ...Gas Power

Diesel Power... POWER

Now

A faster and more economical way to install U-Tubes

Here's how the finished package comes to you. Simply remove the protective covering and the tubes are ready for installation. Either Wolverine Trufin® or plain tubes can be shipped to you on this kind of pallet.

At the right is shown one of the shipping pallets fully loaded. It shows the tubes bent to the correct radii, packed for immediate pallet-to-condenser installation.

Look at all these Advantages:

1 Tubes are fed directly, from shipping pallet into heat exchanger or condenser as they are needed! They are all bent to the correct radii and packed in the right sequence—in line or staggered—according to your prints. Removal can be made from the end or top of pallet.

2 All tubes for one condenser are shipped on one pallet.

3 Instant inspection—eliminates sorting, counting, and handling.

4 Pallet can be handled with existing equipment. Present handling equipment is needed only once to bring pallet to the job.

5 Hairpin-bend tubes eliminate one tube sheet or header.

6 Pallet saves time, crane movements, storage and working space.

7 Pallet is easily knocked down and returned. Supporting straps are cushioned with rubbery compound to protect tubes.

8 Pallet eliminates the time and expense of removing and destroying crating resulting from antique packing methods.

Specify Wolverine Condenser Tubes—Palletized!

WOLVERINE TRUFIN AND THE WOLVERINE SPUN END PROCESS AVAILABLE IN CANADA THROUGH THE UNIFIN CO., LONDON, ONT.

WOLVERINE TUBE DIVISION

Calumet & Hecla Consolidated Copper Company

INCORPORATED

Manufacturers of seamless, non-ferrous tubing

1459 CENTRAL AVENUE • DETROIT 9, MICHIGAN

Wolverine Condenser Tubes stocked by Butler Industries, Inc., 355 South Fourth Street, Beaumont, Texas • Tel.: Beaumont 5-2351

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PLANTS IN DETROIT, MICHIGAN AND DECATUR, ALABAMA

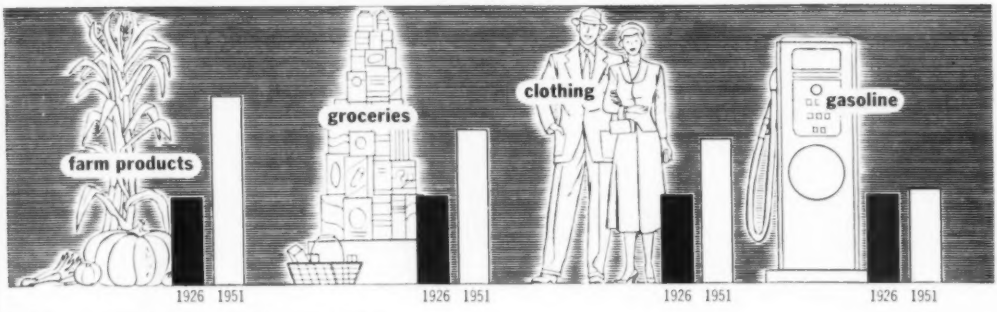
Sales Offices in Principal Cities

Export Department, 13 E. 40th St., New York 16, N. Y.

"Honestly, now—aren't gasoline prices too high?"

Everyone who can remember *what things used to cost only ten or twenty years ago may well think of those times as "the good old days." Recalling them, and the extreme bargains offered during the depression, people have asked Standard such questions as "Honestly, now—aren't gasoline prices too high?"*

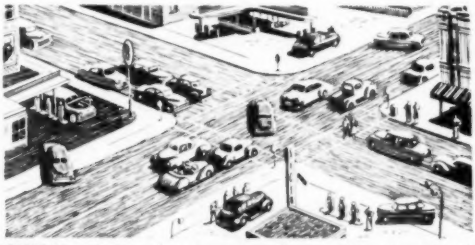
In answer to a question like that, Standard asks you to consider the broad situation. We agree that all prices should be kept as low as possible. But in judging what's "too high," let's see what's happened:



Price comparisons–1926 and 1951

Let's look back to 1926, a fairly normal year in those "good old days." Over the years, most prices have varied greatly. By April of 1951, farm products cost more than twice as much as in 1926, groceries and clothing about two-thirds more. *But in 1951, gasoline costs almost as little as it did in 1926*—actually up less than 4%, except for taxes. (*In the West, Federal and State taxes now total 6¢ to 8¢ a gallon.*) Most people's income has gone up enough in those years so that gasoline takes a far smaller share of their budget. So gasoline today—far from being "too high"—is an exceptionally *good* buy. See *how* and *why* this has come about—

HOW have gas prices been kept from getting "too high"? Partly through improvement in refining methods, made possible by big companies' research. We learned to get more gas out of every barrel of crude. (And it's *better* gas; 2 gallons today do work that took 3 only 25 years ago.)



WHY have gas prices been kept from getting "too high"? Because there's *intense competition* at every level. To stay in business, all oil companies are always looking for ways to cut costs of producing, transporting, refining, and marketing. We keep finding them, passing the benefits on to you.

I'd Like to Know . . . Many people write to Standard asking pertinent questions about the Company. We answer all letters individually, but some points seem of general interest. We take this way of discussing them for every one. If you have a question, we urge you to write in care of: "I'd Like to Know," 225 Bush Street, San Francisco 20, California.

STANDARD OIL COMPANY OF CALIFORNIA

• plans ahead to serve you better

THE *Peerless*

HYDRO-LINE

ENCASED CLOSE-COUPLED VERTICAL CENTRIFUGAL PUMP

FOR LIMITED NPSH APPLICATIONS IN ALL INDUSTRIAL PROCESSES

...and for installation where floor space is at a premium

PEERLESS PUMPS

For application to: **Petroleum Refining Techniques · Line Booster Service · Chemical Processing · Condensate Return Service.**

Especially Suited for Pumping: **Hydrocarbons, such as Gasoline, Butane, Propane, Oils, etc. · Hot or Cold Water · Acids · Bases · Salt Solutions, in mild or concentrated form at temperatures from normal to 400 F.**

HYDRO-LINE CHARACTERISTICS AT A GLANCE

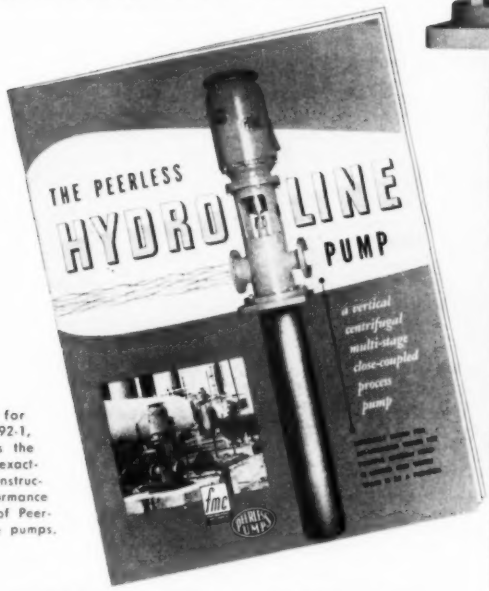
CAPACITIES
Up to 5000 gpm

HEADS
Up to 1500 feet

DRIVES
As required; standard vertical, solidshaft, hollowshaft or explosion-proof motors; steam turbine.

SEALING CHAMBER
Peerless mechanical shaft seal standard construction or packing gland furnished as required.

MATERIALS
Cast iron bowls, bronze impellers, 416 stainless steel shaft standard; any special materials can be furnished on order to suit individual requirements.



USE COUPON for Bulletin No. B-592-1, which describes the successful and exacting design, construction and performance characteristics of Peerless Hydro-Line pumps.

MAIL COUPON FOR BULLETIN

PEERLESS PUMP DIVISION
Food Machinery and Chemical Corporation
301 West Avenue 26
Los Angeles 31, California

Please send us copy of Peerless Hydro-Line Pump Bulletin No. B-592-1.

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COMPANY _____

STREET _____

CITY _____ STATE _____

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PEERLESS PUMPS fmc

PEERLESS PUMP DIVISION
FOOD MACHINERY AND CHEMICAL CORPORATION
Address inquiries to Factories at
Los Angeles 31, California and Indianapolis 8, Indiana
Offices: New York, Chicago, St. Louis, Atlanta, Dallas, Plainview and Lubbock, Texas, Fresno, Los Angeles, Phoenix, Albuquerque, N. M.

FOR sheer toughness there's no other protective coating like Pittsburgh's TANKHIDE!

● **The petroleum industry** has for many years recognized the advantage of using light colored tank paints to minimize the evaporation loss of volatile liquids. With its unusually high heat and light reflection characteristics, Pittsburgh's Synthetic White TANKHIDE prevents the excessive heat absorption that brings about waste by evaporation.

● **Not only** is evaporation loss held to a minimum, but the brilliant white appearance of TANKHIDE is maintained throughout its long life by its self-cleaning action.

● **TANKHIDE** is a combination of intensely white titanium pigments and weather-resistant vehicles which make it a durable, lasting metal protective coating. It is designed for one-coat hiding. TANKHIDE can also be brushed where spraying is not possible.

● **The quick set** and firm character of the film during the drying period not only prevent the collection of dirt and insects but also keep damage due to rain, scuffing and abrasion at a minimum.

● **TANKHIDE** is also available in synthetic gray and black as well as in gray and black oil-base coatings for various purposes. These can be used on wood and metal surfaces with equally good results.

● **Pittsburgh** also offers a wide variety of quality finishes for every need in the petroleum industry. These include IRONHIDE, specially designed for the decoration and preservation of iron and steel structures; METALEAF Aluminum Paints with high light and heat reflecting value; service and bulk station paints; pump enamels and drum finishes.

● **Call on us** for expert advisory service. Our wide experience in supplying finishes for the petroleum industry can be helpful and save you time and money.

• • •

PITTSBURGH PLATE GLASS COMPANY
Industrial Paint Division, Pittsburgh, Pa.

Factories: Milwaukee, Wis.; Newark, N. J.; Springdale, Pa.; Houston, Texas; Los Angeles, Calif.; Portland, Ore. Ditzler Color Division, Detroit, Mich. The Thresher Paint & Varnish Co., Dayton, Ohio. Forbes Finishes Division, Cleveland, Ohio. M. B. Suydam Division, Pittsburgh, Pa.

PITTSBURGH *Industrial* FINISHES

PAINTS • GLASS • CHEMICALS • BRUSHES • PLASTICS

PITTSBURGH PLATE GLASS COMPANY

For Top Flight Gas Welding

Choose from AIRCO'S complete line of Oxyacetylene Welding Supplies

Time Proved . . . Job Tested . . . Money Saving

Available from Local Stocks

That's right! Whether you use a popular Airco gas welding rod, flux, or brazing alloy for production or maintenance operations . . . you're certain of top-notch work—ask any one of the thousands of welders who swear by these Airco oxyacetylene welding supplies.

This well-recognized reputation for top performance didn't just happen—more than thirty years' experience and development have gone into the manufacture of these outstanding gas welding supplies . . . know-how that produces high quality, reasonably-priced items that guarantee a job done faster, done better, done easier and done at less net cost.

For further information about Airco's oxyacetylene welding supplies which includes a complete line of rods, fluxes and brazing alloys, write your nearest Airco Office or Authorized Dealer for a free copy of Catalog 12.

More news about AIRCO products

AIRCO No. 1 ALLOY STEEL
A Smooth-Flowing, High Ductile Rod Insuring Good Control of Molten Pool

This rod (AWS Classification GA60) is ideal for welding low carbon and low alloy steels, including pipe of grades A and B analysis. Outstanding among its many important features is the high ductility in the "as welded" condition. Because of its mechanical properties, this rod is desirable when undertaking qualification tests like those included in The American Standards Association Code for Pressure Piping. It is smooth flowing, insuring good control of the molten pool, and, in addition, will withstand considerable heating without burning.

PHOS COPPER
A High Standard Copper And Phosphorous Brazing Alloy

It is self-fluxing when used on copper-to-copper joints but requires a good low melting point flux when brazing brass, bronze or other alloys. It is completely fluid at approximately 1382°F. at which temperature best results are secured and is used in the manufacture of electrical, refrigeration and air conditioning equipment. Available in rod and strip form.

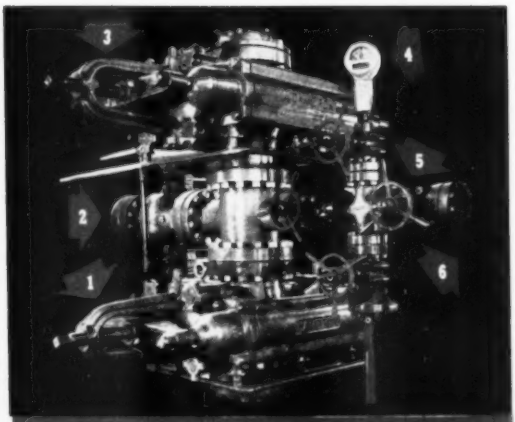
AIRCO MARVEL BRAZING FLUX
A High Quality Flux That Remains Molten And Viscous Over A Wide Temperature Range

It is a uniformly high-quality flux for use in braze welding cast iron, malleable iron, copper and steel and for welding brass, bronze and copper. Marvel Flux remains molten and viscous over a wide temperature range. Its use protects the weld metal from oxidation and effectively reduces or removes oxides and other foreign matter. Marvel Flux is a general purpose flux for the welding shop.

AIR REDUCTION

AIR REDUCTION SALES COMPANY • AIR REDUCTION MAGNOLIA COMPANY
AIR REDUCTION PACIFIC COMPANY
REPRESENTED INTERNATIONALLY BY AIRCO COMPANY INTERNATIONAL
Divisions of Air Reduction Company, Incorporated
Offices in Principal Cities

BE ON THE SAFE SIDE



1. Cameron Type "QRC" Pressure-Operated Blowout Preventer, equipped with blind rams. 2. Cameron Type "HCR" Pressure-Operated Flowline Gate Valve. 3. Cameron Type "QRC" Pressure-Operated Blowout Preventer, equipped with pipe rams. 4. Cameron Mud Line Pressure Gauge. 5. Cameron Flex-Seal Mud Line Valves in mud choke manifold.

Blowouts still happen . . . even on the best regulated drilling rigs. Many of the score or more of disastrous blowouts that occur annually can be traced to: (1) obsolete drilling control units, or (2) drilling control units of inadequate capacity or inoperable condition. Before you start your next well . . . be it wildcat or in proven high pressure territory . . . check over your drilling control equipment to make sure you are on the safe side.

Cameron 1st name in drilling control

CAMERON IRON WORKS, INC.

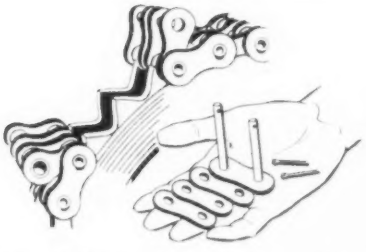
P. O. BOX 1212 • HOUSTON, TEXAS

Export: 74 Trinity Place, New York N. Y. Represented in the sterling area by: British Oilfield Equipment Co., Ltd., Duke's Court, St. James's, London S.W. 1, England

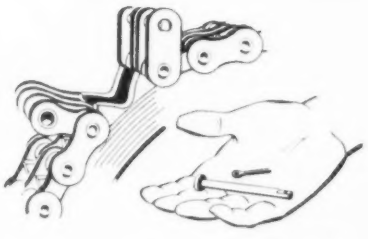
why do it the hard way?

Why struggle with the tough job of assembly, disassembly or repair of standard roller chain, when with Baldwin-Rex "BA" Assembly Roller Chain there's virtually "nothing to it"? "BA" Chain gives you all the advantages of *riveted* roller chain . . . high strength, long life, low cost . . . *plus* even easier assembly, disassembly and repair than with standard cottered chain. With "BA" you gain the advantages of the always high Baldwin-Rex manufacturing standards . . . you save time . . . you save money . . . you can't lose!

Study the illustrations. We think you'll agree that there's no comparison . . . that the "BA" way is the easy way . . . the time-saving way . . . the money-saving way.



With standard roller chain, in order to take the chain apart in the field, it is necessary to drive out the entire pin link with hammer and punch. The pins are struck alternately, and as the side plates are freed, they must be picked up and set aside to prevent loss or damage. There is always the danger of damage to chain parts as the entire pin link is driven out. Assembly presents additional problems. The two pins must be driven back into the chain while three or more side plates (depending on the number of strands) are held in position. You almost need 3 hands to do the job.



With Baldwin-Rex "BA" Assembly, it's an entirely different story. All that is necessary is to remove the cotter and drive out the *single pin* of the special "BA" connector link. The other pin stays firmly riveted in place, preventing the side plates from falling out, thus greatly facilitating the job of reassembly. No danger of damaging parts. Chain is cut by removing only 2 parts . . . the cotter and the single pin connector. To put the chain together, just put the side plates and roller links in place on the sprocket, insert the single pin connector pin and secure with the cotter. That's all there is to it!

EXTRA CONVENIENCE IN ORDERING AND STOCKING, TOO!

The "BA" Assembly is shipped in boxes containing two 5-foot lengths. Each 5-foot length contains two single pin connectors. In addition, a variety of "BA" short units is available. Thus, you or your supply store can quickly and easily make up the exact length of chain to fit your requirements.

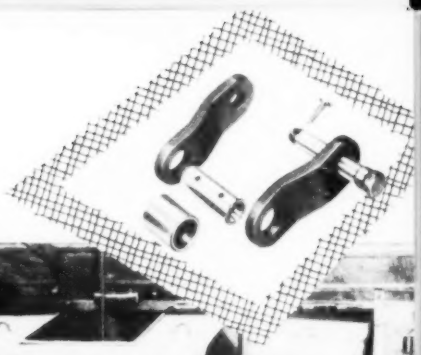
For all the details of the "BA" Assembly, Rex A.P.I. Chains and Rex Oil Field Pumps, send for the new edition of our Oil Field Bulletin 51-8. Write to Chain Belt Company, 1619 W. Bruce Street, Milwaukee 4, Wis.

BALDWIN·REX ®

ROLLER CHAINS

BALDWIN-DUCKWORTH DIVISION OF CHAIN BELT COMPANY

THE *Secret* OF LONGER CHAIN LIFE

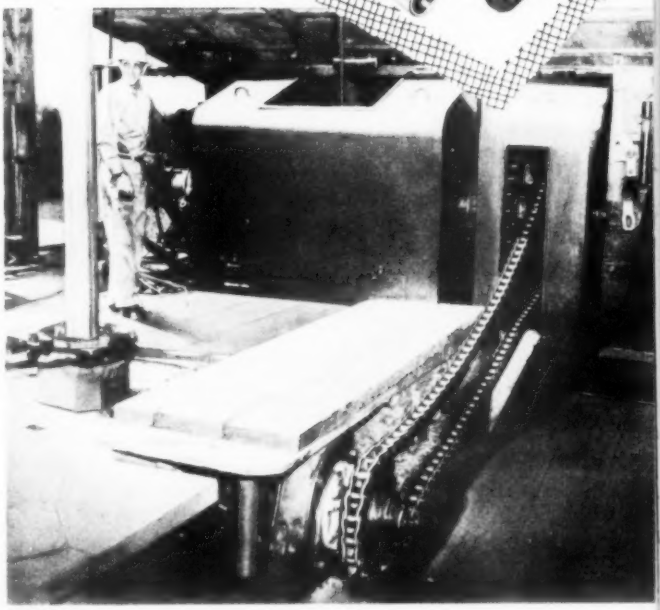


Behind the long life and ability to "take it," which are the "trade-marks" of all Rex A.P.I. Chains, you'll find the famous Rex Unit Link. It's really not a secret. It's just that the quality can't be seen from the surface.

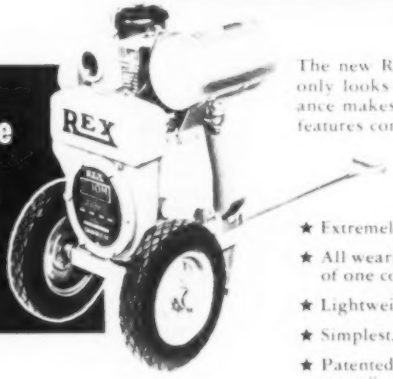
In the Rex Unit Link, pins, rollers, bushings and side bars are made from high quality steel carefully heat-treated to develop maximum strength. These precision parts are then machine assembled to form a link which is *put together to stay*. Each link is exactly alike . . . its precision assembly assures retention of strength and uniformity under even the most adverse conditions.

Side bar holes are machine finished for accurate pitch. There are no sharp corners to start cracking and loosening the pin.

In short, for a chain that gives you longer service life at lowest overall cost, you can't beat Rex!



new look . . new value *IN* OIL FIELD UTILITY PUMPS



The new Rex Self-priming Oil Field Utility Pump not only looks new and different, its outstanding performance makes it the leading value in the field. Five great features combine to put this pump "in a class by itself."

- ★ Extremely simple design.
- ★ All wearing and moving parts accessible with removal of one cover plate.
- ★ Lightweight . . . easily portable, yet really sturdy.
- ★ Simplest, most positive leakproof seal ever designed.
- ★ Patented Adjustable Rex Air Peeler assures "new pump" efficiency for its entire life.

CHAIN BELT REX COMPANY

See it at your nearest supply store.
Rex Oil Field Sales Offices are located in these cities:
New York • Tulsa • Dallas • Houston • Midland • Los Angeles

BALDWIN-REX ROLLER CHAINS

CHAIN BELT COMPANY

BALDWIN-DUCKWORTH DIVISION
Springfield 2, Mass.

REX CHAIN & TRANSMISSION DIVISION
Milwaukee 4, Wis.

REX CONSTRUCTION MACHINERY DIVISION
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WELDOLETS

WELDING FITTINGS FOR ANY PIPING SERVICE

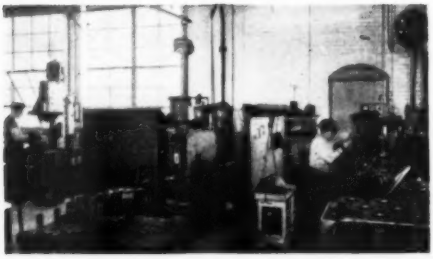
NATURAL GAS COMPRESSOR STATION PIPING CONSTRUCTED ECONOMICALLY AND EFFICIENTLY USING WELDOLET WELDING FITTINGS THROUGHOUT

This installation, together with a number of important applications of WeldOlet Welding Fittings in various types of service is shown in the new Bonney W-3 WeldOlet Catalog.

The completely new Bonney catalog will furnish descriptions, dimensional information and installation instructions. The technical section demonstrates graphically how WeldOlet Welding Fittings offer the quickest, safest and most economical method of establishing and maintaining 100% pipe strength at branch connections in accordance with code provisions.

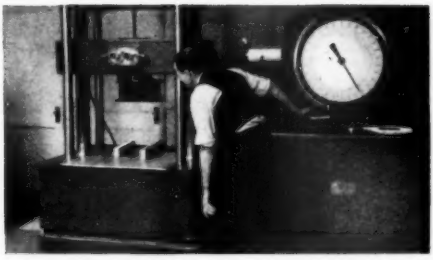
Write for your free copy to: BONNEY FORGE & TOOL WORKS

Why Grinnell is America's #1 Supplier of PIPE HANGERS *and* SUPPORTS



GRINNELL, ALONE, MANUFACTURES A FULL AND COMPLETE LINE OF HANGERS AND SUPPORTS

No other company, anywhere, makes a line as complete or varied. Grinnell produces hangers in thousands of combinations to support any piping.

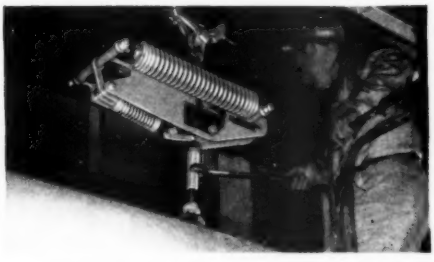


GRINNELL, ALONE, MAINTAINS AN EXPERIENCED LABORATORY STAFF OF TRAINED TECHNICIANS

In its modern, well-equipped laboratory, tests are constantly being made to discover better ways of solving old and new pipe suspension problems.

GRINNELL PROVIDES HIGHLY SKILLED ASSISTANCE AND ADVICE RIGHT FROM THE DESIGN STAGE

Grinnell's Pipe Suspension Department makes available specialized knowledge in the computation of hanger loads and the selection of the correct supports. No other company can match this service.



GRINNELL, ALONE, OFFERS EXPERIENCED FIELD ENGINEERING SERVICE ON THOSE "TOUGH" JOBS

Grinnell maintains an experienced staff of engineers in the field . . . ready to assist you "on the job" with any problems in the erection of pipe hangers and supports, no matter how difficult or complex.

WRITE FOR THIS FREE PIPE HANGER MANUAL

Here, between the covers of a single book, is everything you need to write hanger specifications. This book can be used both as a Grinnell Pipe Hanger Catalog and a comprehensive manual. It's available to you without cost . . . yours for the asking.

Pipe suspension presents a tremendously wide range of problems involving weight, stress, thermal movement, materials and specialized engineering. No one "goes into" the pipe hanger business overnight. Large manufacturing facilities, skilled technicians, and a lot of down-to-earth practical experience are needed.

Grinnell has become America's No. 1 supplier of pipe hangers and supports only because Grinnell has specialized in piping for one hundred years. Grinnell has developed a line of pipe hangers and supports for every piping requirement, from the simplest to the most complex. Grinnell, and Grinnell alone, can offer these advantages:—

- Complete "start-to-finish" production facilities — including research, design, manufacture, engineering and field service.
- Practical experience in every type of piping gained during the past 100 years.
- Coast to coast distribution — enabling "out of stock" purchases, anywhere.

It is important to remember that should some detail of piping arrangement make it necessary to deviate from hangers of standard design, Grinnell will design and manufacture hangers to meet the special requirements. Also, Grinnell is always ready to co-operate with engineers and architects in the preparation of pipe suspension specifications.

Call Grinnell for pipe hangers and supports.

Grinnell makes pipe hangers and supports for every installation . . . from a simple water pipe to high pressure, high temperature steam lines. All are scientifically designed, ruggedly built.

GRINNELL, ALONE, THROUGH ITS CONVENIENT WAREHOUSES CAN SUPPLY YOU "OUT OF STOCK"

No manufacturer of pipe hangers offers a distribution system as thorough or efficient. Grinnell warehouses are located in 30 principal cities . . . with jobbers in practically every city, coast to coast.

GRINNELL

WHENEVER PIPING IS INVOLVED

Grinnell Company Inc., Providence, Rhode Island • Sales Offices and Warehouses in Principal Cities

pipe and tube fittings • welding fittings • engineered pipe hangers and supports • Thermolier unit heaters • valves
Grinnell-Saunders diaphragm valves • pipe • prefabricated piping • plumbing and heating specialties • water works supplies
industrial supplies • Grinnell automatic sprinkler fire protection systems • Amco humidification and cooling systems

UNIT RIG SERVICE PARTS . . . ALWAYS FIT

Unit Rig has never had a parts replacement job that couldn't be done on the rig floor! Old parts may be removed and new parts installed right on the rig floor, because there are no press nor shrink fits that require special equipment.

Extremely close machine tolerances and repeated inspections assure quick and easy fitting without filing, grinding, welding or re-machining.

Prompt delivery of *parts that fit* is one more reason why you save time and money when you own Unit Rig equipment. Make your next drawworks a Unit Rig.

UNIT RIG & EQUIPMENT CO.
TULSA, OKLAHOMA U.S.A.

DESIGNED FOR THE JOB. . . .

UR-512

UNIT RIG DRAWWORKS ARE SOLD EXCLUSIVELY THROUGH THESE AUTHORIZED DISTRIBUTORS IN U.S.A. AND CANADA

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HOUSTON OIL FIELD MATERIAL COMPANY
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LUCEY PRODUCTS CORPORATION
MID-CONTINENT SUPPLY COMPANY
NORVELL-WILDER SUPPLY COMPANY
OIL WELL SUPPLY COMPANY

EXPORT SALES — MID-CONTINENT SUPPLY COMPANY, 42 Broadway, New York City. Cable — MIDUNITRIG

They Say—

'Dilatory Tactics'

"The plaint of the Department of Justice that the tidelands states are employing 'dilatory tactics' in fighting to hold their offshore oil reserves is on a par with tactics used by engineers of the federal grab throughout the 5-year conflict. The self-evident fact is that the Justice Department and its cohorts in Congress and its supporting lobby are the ones guilty of the charge leveled at the defenders of state ownership. . . .

"In all probability, tidelands legislation is dead for the present session, and must go over until next year, when Congress reconvenes. For this delay we are indebted to the Government's failure to join in a reasonable compromise, and the O'Mahoney committee's failure to act on the House-approved quit-claim bill."

Editorial in the Houston Post.

Fuel-Oil Outlook

"If the Iranian emergency continues and normal weather prevails, we will probably have a tight supply situation even without military requirements increasing above those known today.

"It is probable that all facilities will be strained to capacity. Nevertheless, with careful distribution and proper withdrawal from secondary stocks near the point of consumption, we believe the requirements of all consumers can be satisfied."

L. B. Fox, manager, fuel-oil division, Socony-Vacuum Oil Co., Inc., addressing annual convention, New York State Fuel Merchants Association, Inc., Saranac Inn, N. Y.

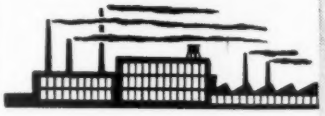
Are Contracts Binding?

"The recent request by the Government of India that a refinery be built there by foreign capital shows how meager is the understanding of this basic issue of whether Iran is within its rights in cancelling its agreement with Anglo-Iranian Oil Co. . . .

"India, in requesting foreign oil companies to build a refinery there, stated she would guarantee there would be no nationalization for 30 years.

"In 1933 Iran made a similar guarantee, except it was for 60 years. . . . If Iran is under no obligation to abide by its agreement, then neither would India nor any other government be required to live up to its agreements. In other words, the day after the refinery was built, India, with the same right as that exercised by Iran, if there be such a right, could unilater-

Like having a tool store right at your door!



Here's efficient tool service—direct to you—through a nearby Snap-on factory branch...

SNAP-ON SERVES INDUSTRY EVERYWHERE THROUGH THESE 41 FACTORY BRANCH WAREHOUSES

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BALTIMORE 18, MD., 1209 E. 25th St.
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BUFFALO 13, N. Y., 628 W. Utica St.
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CHICAGO 16, ILL., 2023 Michigan Ave.
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DALLAS 1, TEXAS, 2932 Commerce St.
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HOUSTON 3, TEXAS, 1810 LaBranch St.
INDIANAPOLIS 2, IND., 848 Fort Wayne Ave.
JACKSONVILLE 6, FLA., 1602 Walnut St.
KANSAS CITY 2, MO., 3635 Main St.
LONDON, ONTARIO, 111 Mt. Pleasant Ave.
LOS ANGELES 14, CALIF., 1717 W. 6th St.
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NEWARK 6, N. J., 823 Sandford Ave.
NEW ORLEANS 13, LA., 1040 Camp St.
NEW YORK 56, N. Y., 397 East 167th St.
OKLAHOMA CITY 3, OKLA., 901 N. Hudson St.
OMAHA 2, NEBR., 109 S. 24th St.
PHILADELPHIA 30, PA., 1710 Fairmount Ave.
PITTSBURGH 8, PA., 7007 Kelly St.
REGINA, SASK., 2070 Albert St.
RICHMOND 20, VA., 1617 West Broad St.
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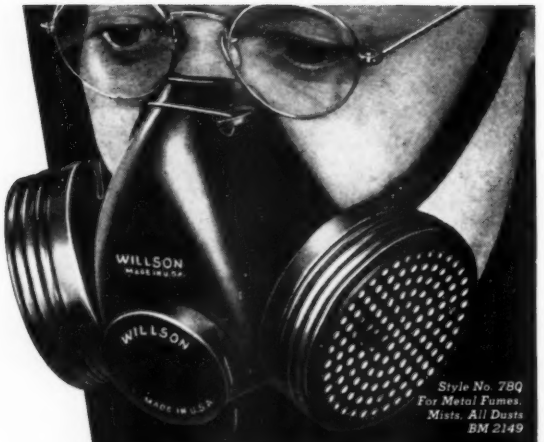

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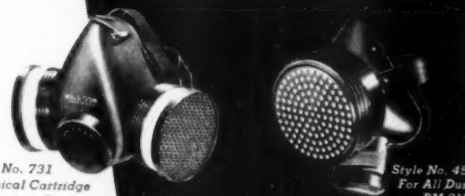

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ally abrogate the contract which she had made with the foreign companies.

"If it should become a principle of international law that governments cannot make contracts which are legally binding on them, as seems to be the contention of Iran, then on what basis can foreign capital be invested in these countries?"

Charles L. Harding, director in charge of Middle East interests of Socony-Vacuum Oil Co., Inc., addressing Section of Mineral Law of the American Bar Association, New York.

Venezuela's Oil Important

". . . Venezuela's contribution to . . . the war effort has never received proper recognition. Oil production here was stepped up by a full 50 per cent during the war years, and that increase may well have represented the margin of victory that was ours. Between them, your country and my own produced nearly all of the additional oil needed to keep the military machine of the allies in action. The United States, of course, having been long in this field of petroleum production, made the largest absolute contribution of oil to the war effort. But if one judges the contribution on a relative basis, Venezuela's record was second to none. . . .

"It is largely through increased use of its energy resources that the world progresses toward its goal of higher standards of living for all. And in recent years it has been petroleum that has contributed by far the largest part of the world-wide increase in the use of energy. In many parts of the globe—and this is true of most of South America—there simply is no satisfactory substitute for oil. If the petroleum supplies were cut off, progress would grind to a painful stop. But where the petroleum supplies increase, progress goes ahead with the increase."

Secretary of Interior Oscar L. Chapman, before the National Petroleum Convention, Caracas.

War Over Caviar?

"With its oil dispute boiling along nicely, the Iranian Government threatens to nationalize the sturgeon, where the caviar comes from. It appears that the Russian fish authority, Glavribispit, has been paying the Iranians about six dollars a pound for caviar which the Russians sell in capitalist markets for thirty dollars. The Iranians want a bigger cut.

"While wishing nobody ill, we do feel that one thing the world very much needs is an international dispute about caviar. Rows about oil and uranium and iron deposits and wolfram tend to produce tension which can lead to wars. But somehow we cannot imagine a war being fought in behalf of caviar for the general, or even for second lieutenants."

Editorial in the Saturday Evening Post.

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CALENDAR

October

Indiana Independent Petroleum Association, fall convention, Hotel Severin, Indianapolis, October 13-14.

Oil Progress Week, October 14-20.

National Association of Corrosion Engineers, Permian Basin Corrosion Tour, Odessa, Tex., October 15-16.

American Petroleum Credit Association, twenty-seventh annual conference, Adolphus Hotel, Dallas, October 15-17.

American Gas Association, annual convention, Kiel Auditorium, St. Louis, October 15-17.

National Metal Congress and Exposition, American Society for Metals, American Welding Society, American Institute of Mining and Metallurgical Engineers, and Society for Non-Destructive Testing, Hotels Statler, Book-Cadillac, and Detroit-Leland, Detroit, October 15-19.

Institute of Gas Technology, annual meeting, Chicago, October 18.

American Chemical Society and Southern Association of Science and Industry, Southwide Chemical Conference, Wilson Dam, Ala., October 18-20.

National Association of Corrosion Engineers, South Central Region, annual meeting, Corpus Christi, Tex., October 18-20.

American Association of Petroleum Geologists, regional meeting, Commodore Perry Hotel, Austin, Tex., October 18-20.

Natural Gasoline Association of America, southern regional meeting, Blackstone Hotel, Tyler, Tex., October 19.

American Institute of Chemical Engineers, sixth annual South Texas Section technical meeting, Hotel Galvez, Galveston, October 19.

Independent Petroleum Association of America, Shamrock Hotel, Houston, October 22-23.

American Institute of Electrical Engineers, fall general meeting, Hotel Cleveland, Cleveland, October 22-26.

Fifteenth Penn State Technical Conference on Petroleum Production meeting at State College, Pa., October 24-26.

Society of Exploration Geophysicists, eastern regional meeting, Webster Hall Hotel, Pittsburgh, October 25.

American Institute of Mining and Metallurgical Engineers, petroleum branch, annual meeting of West Coast chapter, Elks Club, Los Angeles, October 25-26.

Society of Automotive Engineers, diesel-engine division, Drake Hotel, Chicago, October 29-30.

American Institute of Mining and Metallurgical Engineers, fall meeting of all branches in connection with Mexican Bureau of Mines, Hotel Del Prado, Mexico City, October 29-November 3.

American Society for Testing Materials, northern California district, San Francisco, October 31.

Society of Automotive Engineers, fuels and lubricants division, Drake Hotel, Chicago, October 31-November 1.

November

Louisiana-Arkansas Division, Mid-Continent Oil and Gas Association, twenty-ninth annual meeting, Roosevelt Hotel, New Orleans, November 1-2.

American Association of Petroleum Geologists, Society of Exploration Geophysicists, and Society of Economic Paleontologists and Mineralogists, annual joint meeting, Pacific sections, Ambassador Hotel, Los Angeles, November 1-2.

American Petroleum Institute, thirty-first annual meeting, Stevens Hotel and Palmer House, Chicago, November 5-8.

Southwest Research Institute, second conference on coastal engineering, Rice Hotel, Houston, November 7-10.

American Society for Testing Materials, southern California district, Los Angeles, November 8.

Gulf Coast Association of Geological Societies, first annual meeting, Roosevelt Hotel, New Orleans, November 15-17.

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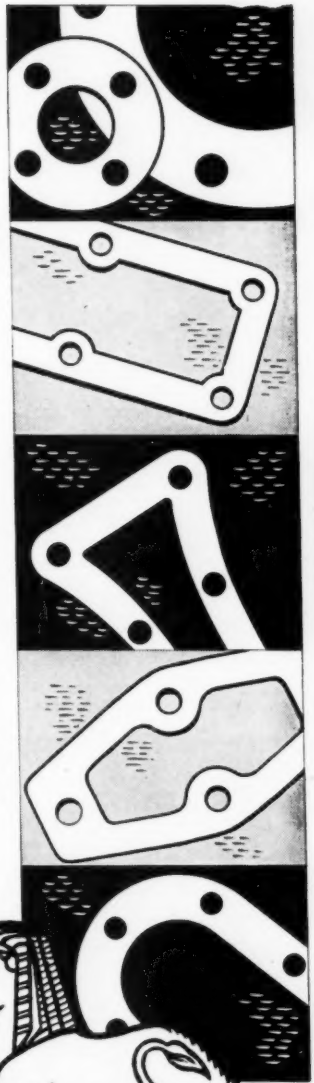

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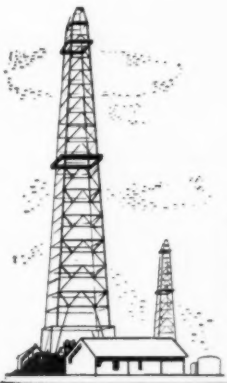

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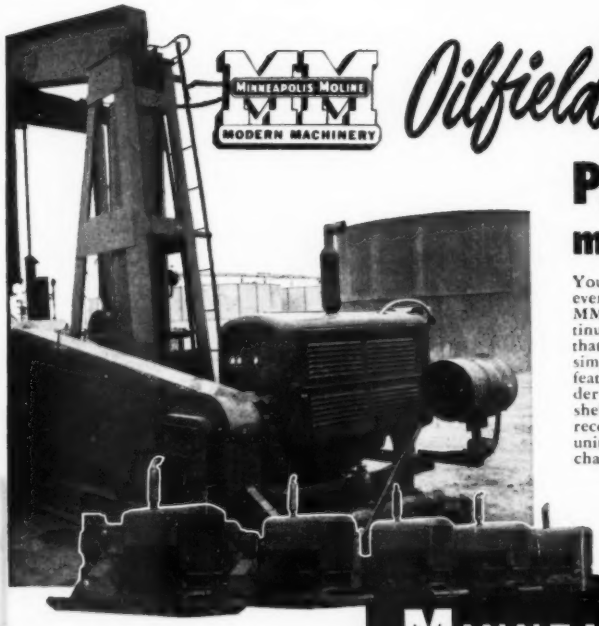

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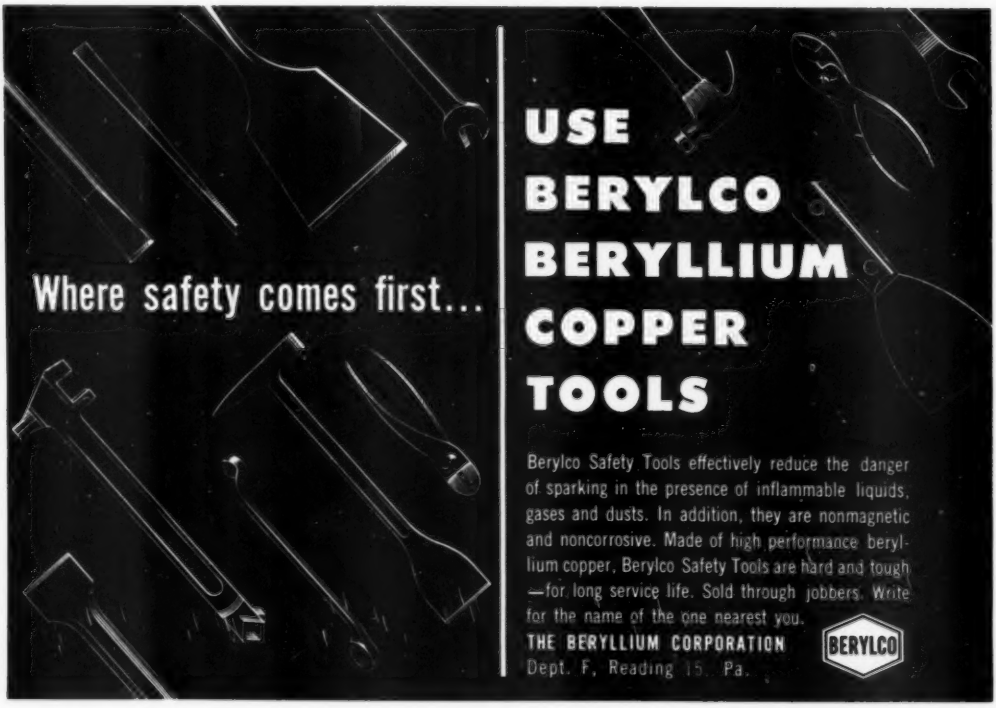

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Rocky Mountain Oil and Gas Association annual meeting, Cosmopolitan Hotel, Denver, November 15-17.

Society of Exploration Geophysicists regional meeting, Baker Hotel, Dallas, November 19-20.

Natural Gasoline Association of America, Panhandle-Plains regional meeting, Herring Hotel, Amarillo, Tex., November 20.

Mid-Continent Oil and Gas Association, annual board of directors meeting, Tulsa Club, Tulsa, November 20.

American Society of Mechanical Engineers, annual meeting, Chalfonte-Haddon Hall, Atlantic City, November 25-30.

Twenty-third Exposition of Chemical Industries, Grand Central Palace, New York City, November 26-December 1.

December

American Institute of Chemical Engineers annual meeting, Chalfonte-Haddon Hall, Atlantic City, December 2-5.

Chemical Specialties Manufacturers Association, thirty-eighth annual meeting, Mayflower Hotel, Washington, D. C., December 3-4.

Interstate Oil Compact Commission, annual meeting, Hotel Marion, Little Rock, Ark., December 11-12.

American Association for the Advancement of Science, annual meeting, Philadelphia, December 27-28.

1952 Meetings

Society of Automotive Engineers, annual meeting, Hotel Book-Cadillac, Detroit, January 14-18.

American Association of Petroleum Geologists, Rocky Mountain Section, second annual convention, Salt Lake City, February 28-29.

American Society for Testing Materials, spring meeting, Hotel Statler, Cleveland, March 3-7.

National Association of Corrosion Engineers, eighth annual conference and exhibition, Galvez Hotel, Galveston, Tex., March 10-14.

American Institute of Chemical Engineers, regional meeting, Atlanta, March 16-19.

American Petroleum Institute, Division of Production, Mid-Continent district meeting, Broadview Hotel, Wichita, Kans., March 19-21.

Southwestern Gas Measurement Short Course, University of Oklahoma, Norman, April 8-10.

Southern Gas Association, annual convention, Galveston, Tex., April 28-30.

American Institute of Chemical Engineers, regional meeting, French Lick, Ind., May 11-14.

American Gas Association, Natural Gas Department spring meeting, Biltmore Hotel, Los Angeles, May 12-13.

American Petroleum Institute, Division of Refining, seventeenth midyear meeting, San Francisco, May 12-15.

American Gas Association, production and chemical conference, Hotel New Yorker, New York, May 26-28.

Canadian Gas Association, Chateau Frontenac, Quebec, June 8-12.

American Petroleum Institute, midyear standardization meeting, Brown Palace Hotel, Denver, June 9-14.

NOMADS

Tulsa Nomads, third Friday of each month. After Five Room, Tulsa Hotel.

Dallas - Fort Worth Nomads, first Monday of each month, Greater Dallas Club.

Houston Nomads, second Monday of each month, Ye Olde College Inn, Houston.

Los Angeles Nomads, second Wednesday of each month, Jonathan Club.

New York Nomads: October 29, regular meetings, Louis Sherry's; December 8, Christmas dinner dance, Hotel Pierre.

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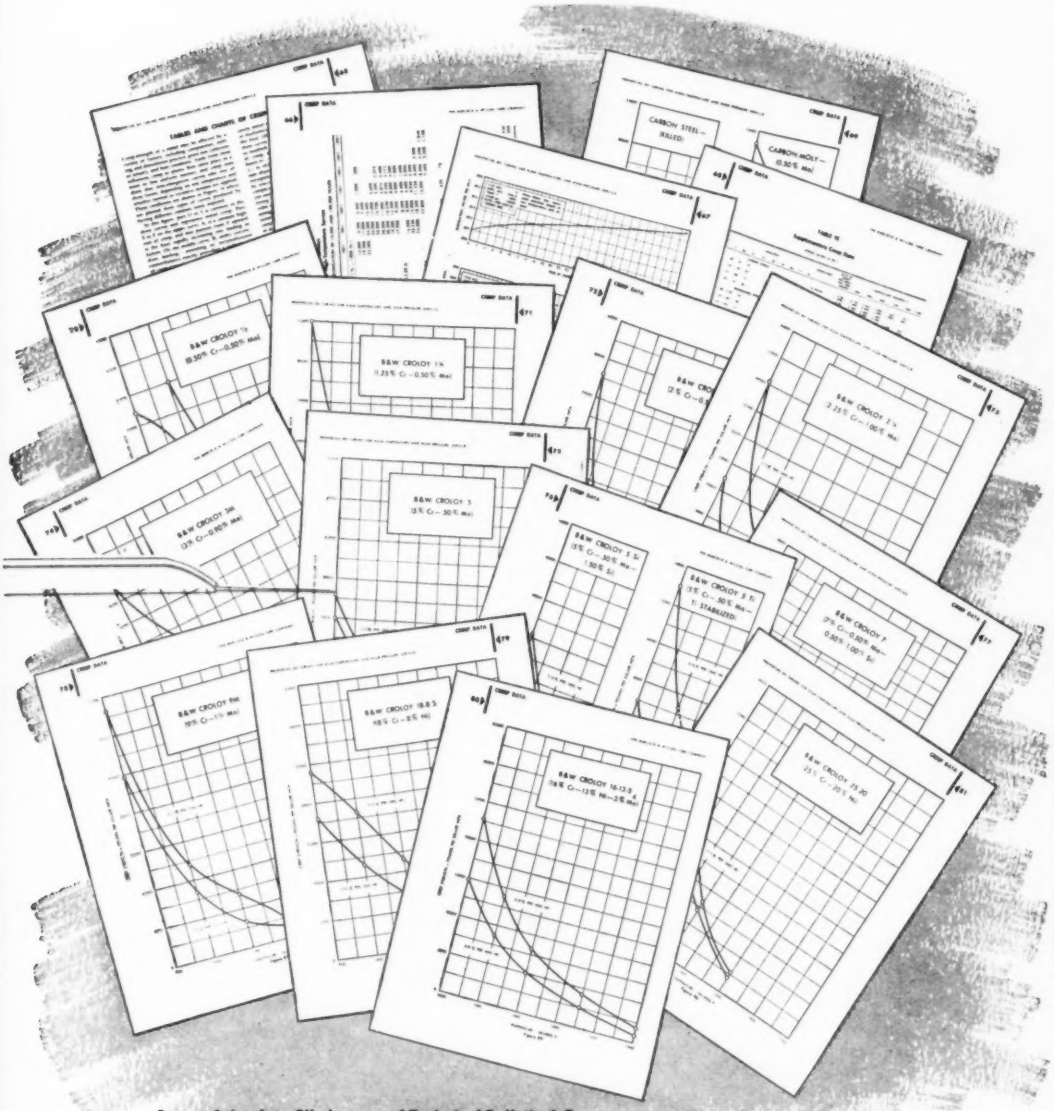

Some of the data filled pages of Technical Bulletin 6-E, covering creep strength and other performance characteristics of B&W Tubing for service at high temperatures and pressures. Write for a free copy... The Babcock & Wilcox Tube Company, Beaver Falls, Pa.

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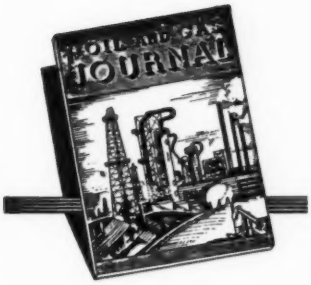

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JOURNALLY Speaking

Dean's Dreams

IN our pipe-line issue last week, "Cap" Finney, who can well be called the dean of pipe liners, indulged himself in dreaming about the pipe line of the future.

It was quite a pipe dream. Through his smoke rings Cap conjured up lines 5 ft. in diameter, pipe made of some new wonder material which won't corrode or split, and a machine which would travel along the right-of-way and stick the joints together untouched by human welders' hands.

Since Cap has been a leading pipe liner for 37 years, his dreams have more than ordinary substance, but this sort of stuff can be carried too far. We're all for progress, but it scares us when it comes so fast. We wonder if Cap realizes the socio-economic significance of his suggestions.

This line of thinking could make pipe lining so efficient that pipe liners would work themselves out of a job—but that's not the half of it. Some other bright young dreamer is liable to come along with an atomic pill or something that will do away with the need for any petroleum products at all, and then what will happen to pipe liners, the Big Yellow Book, and all of us?

Benefactor

SPEAKING of dreamers, last week's issue also recorded the results of a dream by Dr. Spitz out in Los Angeles—a sort of glorified electric bed warmer to keep paraffin and asphalt from congealing in an oil well.

To get this story, Dave Stormont, our favorite oil publication's West Coast editor, visited Dr. Spitz at his home and came away with his eyes popping at the vision of the marvelous low-voltage world of the future. Doc hooked up his high-amp gadget to his barbecue pit and turned out a hamburger (well done, with pickle and onion on the side) in exactly 15 seconds. Dave saw it with his own eyes and tested it with his own palate, and says it works fine. This invention, of course, will be a tremendous boom to tourists who don't have time to stop more than 15 seconds for lunch.

While they munched their short-order hamburgers, Dave's host unveiled visions of future worlds for his contraption to conquer. One adaptation will dry a lady's hair in 5 minutes and without heat, thus doing away with the present necessity for a lady to sit under a hot drier for 45 minutes (that's what the Doc said; Dave disclaims all knowledge of beauty parlors).

A still greater boon to the human race is Dr. Spitz's plan to let fathers enjoy Christmas more by cutting down the time required to trim the tree after the kids go to bed Christmas eve. All you have to do, he says, is hook a wire from his low-amp machine to the tree and then hang bulbs on any old place and they all light up.

That Week

THESE new ideas we have just been discussing all come under the head of oil progress and the contributions of the petroleum industry to increased living standards of everybody, which reminds us that here it is Oil Progress Week again.

Abadan or Abaddon?

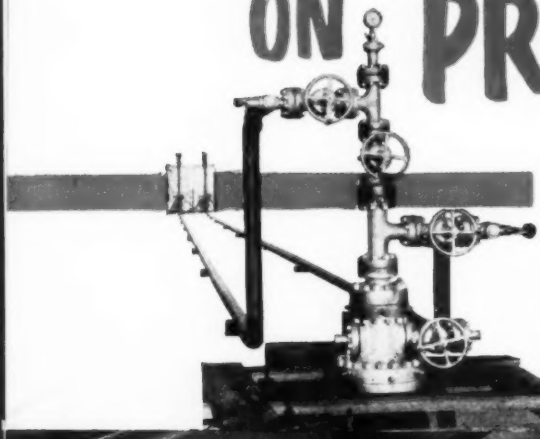
OUR researches into the history of the Middle East have failed to uncover the origin of the name Abadan, site of the Iranian refinery which is now the trouble spot of the oil world. However, we did run across a word so similar and of such evil portent that the implication made us shudder.

The other word is Abaddon, an ancient Semite term meaning "place of destruction; bottomless pit; abyss of Hell." Can it be that the two names are variants of a single word in one of the ancient tongues and that they mean the same thing?

Just think what horrible prophecies a seer of the Jeremiah type could wring from this parallelism. Is Abadan going to turn out to be Abaddon, a place of destruction, the abyss of Hell? Will it mark the beginning of the end of British oil operations in the Middle East? We hope not, but that morbid similarity of names preys upon the occult corners of our subconscious.

Henry D. Ralph.

ON PRODUCTION



● "Christmas tree", flow lines and tanks... signal that the well is "on production" . . . oil starting on its long journey to the ultimate consumer.

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Oil's "Week"

Oil Progress Week is a phenomenon in public relations, an idea rejected by experts but put over by amateurs, a spontaneous activity more successful than carefully programed projects.

When the oil industry realized it must do something to improve its standing with the public, it started with orthodox methods which pleased almost no one. Industry executives suggested other tacks but the value of the entire program was questioned by many.

But while the experts were wrangling in their ivory towers something was stirring in the grass roots. Two or three smaller communities in the oil country staged "Oil Appreciation" days in honor of their chief industry. These were purely local affairs and—to a public-relations expert—as corny as Kansas in August.

But they opened a lot of eyes. They opened the eyes of the communities to the size and importance of the oil industry. They opened the eyes of participating oil men to the value of telling their story to their neighbors. And finally they opened the eyes of the experts to the potentialities of public relations on the local level.

This resulted in a popular demand for a national Oil Progress Day and then an annual Oil Progress Week. The experts were skeptical. There already were more special-observance "weeks" than calendar weeks in the year, and most of them got not even passing notice from the public.

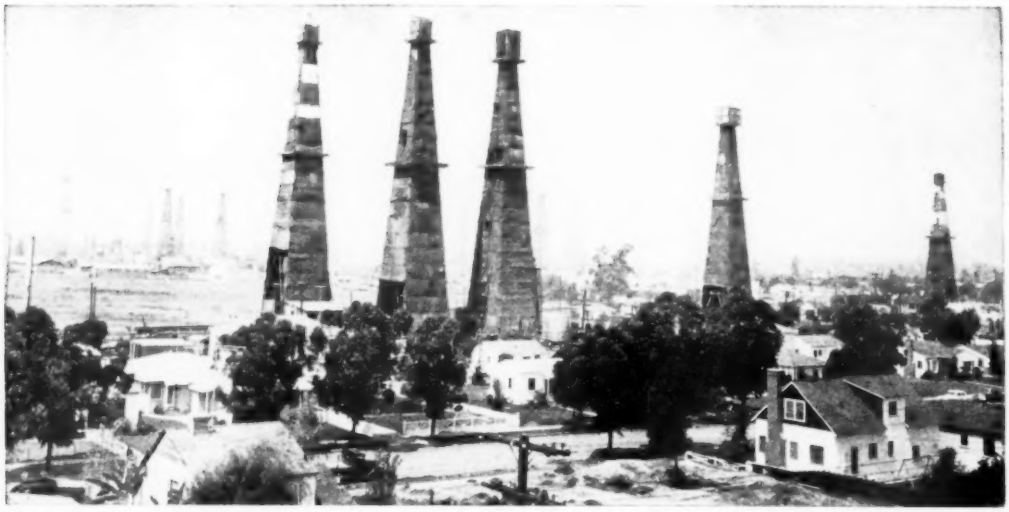
Yet this year the third Oil Progress Week will be noted in nearly every community in the nation, with tens of thousands of oil men and women voluntarily taking part in more different kinds of public-relations activities than the experts can list, let alone originate or direct. Oil's week has become the envy of every publicity-minded industry.

Editors, mayors, school officials, and civic leaders take part because it is their neighbors who are staging the local events and telling about their own jobs. And local oil men do this because they have come to realize that they have a story worth telling, that their neighbors are interested in hearing it, and that the telling of it gives them greater pride in their daily work.

This spontaneous grass-roots public relations working from the bottom up is doing the industry more good than any planned program working from the top down. But that is less than half its value. A greater value lies in the effect on the participants. When a man publicly brags about his job one week in the year he is pretty apt to spend the other 51 weeks making his job worth bragging about, and thus the industry has a still better story for the next year and for all the year.

Here is the real, fundamental, lasting worth of Oil Progress Week, the point the experts overlooked—when good relations with the public becomes the responsibility of everyone, the entire industry does a better job of earning the respect of its neighbors.

THIS WEEK



NEW LONG BEACH HOT SPOT.—In the vicinity of California and Wardlow Streets on the northwest edge of Signal Hill there has been a new outbreak of drilling following discovery of a 6,700-ft. fault block pool. Eleven producers, with initial productions ranging from 500 to 1,400 bbl. daily, have been completed and seven rigs are at work on new wells. With drilling sites unavailable or at a premium, all drilling is directional with sound-insulated derricks being employed.

SUPPLY AND DEMAND—PAD warns that world shortages of petroleum during first quarter of 1952 may be severe, depending on how much can be produced, refined, and stored in United States this quarter. . . . 'Bureau of Mines revises demand forecast, sets total for crude and products at 7,490,000 bbl. daily, up 687,000 bbl. daily or 10.1 per cent over average for 1950 and 38,000 bbl. daily greater than previous forecast. . . .

INDUSTRY—Northeastern consumers, resellers storing heating oils earlier than usual in anticipation of possible higher costs in transporting fuel from Gulf Coast. . . . 'Public is paying a third of its gasoline dollar for taxes; new U. S. levy expected to add additional burden, survey shows. . . . 'Fight over imports continues. . . . Tariff Commission hears from all sides in argument over elimination of present quota, cut in tax. . . .

STEEL—PAD fighting for bigger allocations of steel for petroleum industry, Chapman tells Texas Mid-Continent Oil and Gas Association. . . . Group surmises industry may be asked to drill as many as 50,000 wells in 1952 if steel allocations can be obtained. . . . 'First-quarter steel allocations may be cut by 1,000,000 tons. . . . 'NPA assures warehouse distributors that they will get at least as much oil-country goods from steel mills after January 1 as they averaged during January to September 1950. . . . 'Adequate tanker, tank-car supply seen. . . .

PRODUCTION—Better methods of reservoir engineering, secondary recovery to increase oil production discussed at A.I.M.E. meeting. . . . 'Shell's Benton, Ill., water flood has produced 1,000,000 bbl. of oil in only 22 months. . . . 'New shooting method using shaped charge vertically for high-pressure gas wells developed by New York State Natural Gas Corp. . . . 'Meetings scheduled in Midland soon on Spraberry trend may have major bearing on future development of vast area. . . .

REFINING—Rapid progress being made in enlarging basic United States refining capacity for output of fuel oils, gasoline, avgas, defense mobilizer reports. . . . Accelerated amortization aids program. . . . 'Gulf lets contracts for major expansion facilities at Philadelphia refinery. . . . 'Pure to expand its Smith's Bluff plant. . . .

ACTIVITY—Crude production for week ended October 6 averaged 6,261,635 bbl. daily, up 32,010 bbl. daily. . . . 'Total completions for the week decreased 19 wells to 888. . . . Wildcat completions totaled 193 compared with 198 for previous week and 163 for same week last year. . . . 'Rotary rigs operating in United States on October 1 dropped to 2,789 from the all-time record of 2,818 a week earlier. . . .

TRENDS—Crude stocks are expected to increase in October. . . . Production of crude and field condensate is estimated at about 6,340,000 bbl. daily. . . . 'Crude imports will average at least 450,000 bbl. daily. . . . Crude exports, transfers, and losses will probably not exceed 100,000 bbl. daily, leaving 6,690,000 bbl. daily for refinery runs. . . . 'If runs are held to 6,550,000 bbl. daily, crude stocks will increase about 4,000,000 bbl. . . .

INTERNATIONAL—Iranian premier arrives in New York to appear before U.N. Security Council in opposition to consideration of British complaint. . . . 'British complete removal of personnel from Iran. . . . 'Aramco going all-out in its efforts to help offset loss of Iranian crude, taxing field installations to capacity. . . . 'Anglo-Iranian studying prospects of building large refinery in Australia. . . .

Oil Shortage Feared

How serious impact might be depends on amount U. S. can produce, refine, and store this quarter, PAD warns

Bertram F. Linz

WASHINGTON. — World shortages of petroleum during the first quarter of 1952 may be fully as severe as that resulting from the stoppage of Iranian production last June, it is feared by Petroleum Administration officials.

How serious the impact of such shortages would be will depend upon the extent to which the domestic industry can produce, refine, and store oil and products during the current quarter. Deputy Petroleum Administrator Bruce K. Brown informed the Texas Railroad Commission this week.

Brown's plea to the commission followed a similar written appeal to Louisiana Conservation Commissioner S. L. Digby last week. The purport of his presentation to the two states was that current production allowables should be maintained through the remainder of the year, despite the fact that substantial progress has been made toward minimizing the effects of the Iranian shutdown and the considered opinion in some quarters of the oil industry that domestic production should be reduced.

States don't agree.—Commissioner Digby's letter was addressed to Secretary of State Dean Acheson and was in much the same vein as the letter sent Acheson the previous week by Commissioner Ernest O. Thompson of the Texas Railroad Commission *(The Oil and Gas Journal, October 4, page 152)*.

Both pointed out that current high rates of production are a peril to conservation and they hinted that their states may not maintain these rates long in spite of the requests of federal officials. Digby said he is hopeful that Louisiana can return to its August rate of production—641,000 bbl. daily—no later than November 1. At the request of PAD, Louisiana raised its allowable to 657,481 bbl. in September but dropped it to 653,370 bbl. daily for October.

Federal view.—In answering Thompson and Digby, Brown told the commissions of the progress made in reducing the strain of the Iranian situation by an increase of 270,000 bbl. daily in Middle East production which has offset the loss of 150,000 bbl. daily of Iranian crude and provided an additional crude supply of 120,000 bbl. daily, enabling foreign refineries to increase their runs to stills.

Another important factor, he said, has been a reduction of 75,000 bbl. daily in foreign products demand accomplished by foregoing seasonal stock additions in some areas, restricting supplies to consumers, such as aviation gasoline in the Indian Ocean area, avoiding expansion of marketing outlets, drawing on military stocks, and reducing previous demand estimates.

"By and large," Brown said, "this reduction results from stop-gap measures which may be employed once but which only borrow from future demand if the Iranian shutdown continues beyond the turn of the year. Should the disruption of Iranian supplies continue into the first quarter of 1952, we expect petroleum shortages outside the United States to exceed those of the September-December 1951 period."

Cites requirements. — Through these several measures, Brown explained, the requirements needed from the domestic industry now and to the end of the year have been cut from the 270,000 bbl. daily of refined products and 190,000 bbl. of diverted crude imports—a total of 460,000 bbl. daily—to 190,000 bbl. daily of products and 90,000 bbl. of diverted crude—a total of 280,000 bbl. daily.

The impact on the domestic industry of supplying this 190,000 bbl. daily of products consists of 46,000 bbl. daily of gasoline, 37,000 bbl. of kerosine, 60,000 bbl. of distillate, and 47,000 bbl. of residual.

Based on crude production through the rest of the year of 6,300,000 bbl. daily and refinery runs of 6,675,000 bbl. daily, yields at the percentages specified would build stocks by December 31 as follows: Gasoline, at 43.2 per cent, 123,000,000 bbl.; kerosine, at 5.7 per cent, 24,000,000 bbl.; distillate, at 20.8 per cent, 84,000,000 bbl.; residual, at 20.6 per cent, 48,000,000 bbl.; and crude, 243,000,000 bbl.

"In our opinion," Brown declared, "the above stock levels as of December 31, 1951, would be desirable in view of anticipated 1952 domestic demands and also in view of probable world petroleum shortages in the first quarter of 1952, which may be greater than those we anticipate in the last quarter of 1951. Since we believe that domestic refinery capacity will have to operate at close-to-capacity levels in the first quarter of 1952 merely to supply normal demands, the only other source of refined products from the United States would be greater-than-normal stock withdrawals.

"If the year-end stock levels set forth above are achieved, we estimate that about 100,000 bbl. per day of refined products could be made available from stocks in the first quarter of 1952 without greatly endangering domestic supplies. The contribution which the United States can make toward mitigating world shortages in the first quarter of 1952 thus hinges on what this country is able to produce, refine and store in the fourth quarter of 1951."

All hope that Iran could be brought back into production before the peak winter consuming season has been abandoned and, regardless of possible favorable developments in British-Iranian negotiations, normal supplies cannot be expected from Iran in any event until after the turn of the year, Brown said.

Demand Forecast Revised

Crude, products needs estimated at 7,490,000 bbl. daily, 687,000 bbl. daily over 1950 average, by Bureau of Mines

TOTAL demand for crude and petroleum products this year is estimated at 7,490,000 bbl. daily in a revised forecast just made by the Bureau of Mines.

This expected demand represents an increase of 687,000 bbl. daily or 10.1 per cent over the average for 1950 and is 38,000 bbl. daily greater than the estimate in the previous forecast, released by the bureau late in May.

The relatively small change in the total demand estimate since the last forecast is a net balance of a much larger increase for exports and a decrease for domestic demand.

Exports for the year are now set at 389,000 bbl. daily compared with 274,000 bbl. daily in the May forecast. The large revision was necessitated by the gain in product shipments in the last half of the year to meet the demands of customers normally supplied from the refinery at Abadan. The estimate for last-half exports was raised 64 per cent from the earlier forecast.

Domestic demand for the year is now forecast at 7,101,000 bbl. daily,

or 77,000 bbl. daily less than in the May estimate. However, this is still 602,000 bbl. daily or 9.3 per cent greater than the 1950 average.

Each major product has a smaller domestic demand estimate than in the last forecast, with the greatest reduction for distillate fuel. Domestic demand for distillate is now expected to average 1,556,000 bbl. daily compared with 1,614,000 bbl. daily in the May forecast.

Total new supply for the year is forecast at 7,559,000 bbl. daily compared with the previous estimate of 7,529,000 bbl. daily and an actual 1950 average of 6,747,000 bbl. daily.

Iran affects exports.—The trouble in Iran which made it necessary to increase product exports from this country also pulled products from refineries in the Caribbean area, resulting in a decrease in United States imports for the last half of the year. The daily average of imports for the year is estimated at 857,000 bbl. compared with the May estimate of 943,000 bbl.

On the other hand, crude production is now forecast at the all-time high of 6,140,000 bbl. daily for the year, up 13.7 per cent from the average for 1950 and 1.9 per cent from the last forecast.

Crude runs.—Crude runs at refineries are expected to average 6,510,000 bbl. daily for the year with a peak of 6,609,000 bbl. daily reached in the fourth quarter.

The bureau made a preliminary estimate of supply and demand for the first quarter of 1952 without a breakdown by products. Total demand for the first quarter is forecast at 8,140,000 bbl. daily or 5.2 per cent greater than in the first quarter of 1951. The estimate of required refinery runs, amounting to 6,690,000 bbl. daily, assumes total exports at about the same rate as last year and product stock reductions of 330,000 bbl. daily for the quarter.

If crude imports average 550,000 bbl. daily in the first 3 months of next year, demand for domestic crude will approximate 6,260,000 bbl. daily.

Northeast Storing Early

Possible higher costs in moving heating oils to area causing consumers, resellers to fill their tanks earlier

John C. Casper

THE prospect of higher costs in transporting heating oil from the Gulf Coast this winter has caused consumers and resellers in the Northeast to fill their storage tanks early to an extent greater than in previous years.

East Coast suppliers of No. 2 fuel for home heating have filled a high percentage of consumer tanks and have moved primary stocks to storage near points of consumption.

In past years, the sale of home-heating fuels during the summer months has been the primary objective of suppliers in the high-demand areas of the northeastern states. Since the war, summer discounts have been offered and consumers have been protected against late summer reductions in price in an effort to get the oil into consumer and reseller tanks during the summer months. In most cases the results have been disappointing.

If summer discounts were offered this year, the practice was not general. However, the total volume of distillate fuel in East Coast consumers' tanks is probably greater than at any time in the past.

Demand boosted.—Indicated refinery demand for distillate fuel in Districts 1 and 3 for the period from the first of May to September 29 was 16.5 per cent greater than in the same months of 1950. It is admitted that demand since the first of July has been boosted by increased exports to areas normally supplied from Abadan, but even if these extra shipments are deducted, the remaining demand is up more than 11 per cent over last year.

Surplus distillate stocks from refineries in District 3 are being moved to the East Coast. District 1 inventories of distillate fuels on September 29 amounted to 34,243,000 bbl. for a gain of 10,000,000 bbl. or 41 per cent over the same date last year. On the other hand, distillate stocks in District 3, totaling 18,591,000 bbl., were up only 727,000 bbl. or 4 per cent.

Price is reason.—The reason back of this flow of fuel to consumer tanks and to primary storage on the East Coast is that both suppliers and consumers are expecting higher price ceilings before the end of this year.

Price differentials between Gulf Coast and East Coast markets are due principally to transportation costs based on tanker rates. These rates vary widely even within a given year. Spot rates in May 1950 were 35 per cent less than the Maritime Commission base or about .59 cent for moving a gallon of No. 2 fuel from the Gulf Coast to points north of Hatteras. By January 1951 the rate had jumped to MC base plus 200 per cent, or about 2.13 cents a gallon for moving distillate fuel.

Most postings for barge delivery of No. 2 fuel in New York Harbor have been at the suppliers' ceiling of 9 cents. A few jobbers and brokers have ceilings of 9.25 cents. Since No. 2 fuel is not available on the Gulf Coast under 8 cents a gallon, the differential of 1 cent a gallon will not cover transportation costs at the current spot rate of about MC plus 30 per cent.

Even with consideration given to the volume of distillate moving in company-owned tankers and tankers

BUREAU OF MINES REVISED FORECAST SUPPLY AND DEMAND — ALL OILS
(Thousands of barrels daily)

	Actual			Forecast		Prev.	Actual
	First quarter	Second quarter	Third quarter	Fourth quarter	Year 1951	forecast 1951	year 1950
Production	6,528	6,684	6,758	6,832	6,702	6,586	5,900
Crude	5,965	6,143	6,209	6,239	6,140	6,027	5,402
Other oils	563	541	549	593	562	559	498
Imports	926	876	788	842	857	943	847
Crude	484	531	529	505	512	537	487
Refined	342	345	259	337	345	406	360
New supply	7,454	7,560	7,546	7,674	7,559	7,529	6,747
Stock change	−283	−497	−296	−239	−69	−77	−56
Crude	−163	−158	−69	−11	−19	−14	−13
Other oils	−120	−339	−227	−250	−50	−63	−43
Total demand	7,737	7,063	7,250	7,913	7,490	7,452	6,803
Motor fuel	2,732	3,210	3,348	3,109	3,101	3,104	2,792
Residual	1,826	1,543	1,449	1,706	1,630	1,652	1,559
Distillate	1,725	956	965	1,522	1,290	1,274	1,116
Kerosine	473	236	249	457	354	364	329
Other	981	1,118	1,239	1,119	1,115	1,058	1,007
Exports	289	409	465	391	389	274	304
Crude	89	86	78	65	79	74	95
Refined	200	323	387	326	310	200	209
Domestic demand	7,448	6,654	6,785	7,522	7,101	7,178	6,499
Motor fuel	2,668	3,117	3,230	3,011	3,008	3,041	2,725
Residual	1,788	1,463	1,348	1,630	1,556	1,614	1,515
Distillate	1,693	900	888	1,446	1,230	1,241	1,081
Kerosine	469	220	237	446	343	359	323
Other	830	954	1,082	989	964	923	855
Runs to stills	6,492	6,398	6,538	6,609	6,510	6,421	5,739

under long-term charters, average transportation cost this winter will be well above a cent a gallon.

Action needed.—It is rather generally agreed that something will have to be done to prevent actual losses on the movement of distillate to the East Coast if the heating-oil demand in that area is to be met. Tanker operators in a meeting with officials of Office of Price Stabilization stated that enough tankers will be available to "satisfactorily supply" heating oil for the domestic trade next winter. In the same meeting, OPS officials agreed with operators that it would be "impractical" to issue specific regulations for the tanker industry at this time.

Even if enough tankers are available to move the needed distillate, the problem is still unsolved since there is no assurance that spot tanker rates will not go as high as last winter, and there is a limit to the percentage of the total volume of heating oil that can be moved at a loss.

Record Gasoline Taxes

Public paying about a third of its gasoline dollar for taxes; probable new U. S. levy will add additional burden

Ted A. Armstrong

THE year 1951 is seeing another new record established in the amount of state taxes imposed on the oil industry's chief product—gasoline.

This year there will be an additional burden if, as expected, the additional half-cent tax is levied by the federal Government. This tax, already agreed upon by House and Senate committees, will go into effect November 1 if the tax bill is passed by both houses and signed by President Truman by October 21, which is considered probable.

Eight states already have boosted their gasoline tax this year, and bills still are pending in Missouri, where the legislature is still in session. So far, the average tax of the 48 states and the District of Columbia has climbed to 5.27 cents per gallon, a new high and a full cent over the 1936 tax. When the feredal tax goes into effect, it will mean that the motorist in the average state will be paying 7.27 cents per gallon in federal and state taxes.

Actually, the unweighted average is higher, since seven states permit counties or municipalities to levy additional motor-fuel taxes, ranging up to as much as 3 cents per gallon.

TAX RATES IMPOSED DURING 17 YEARS SINCE JANUARY 1, 1935
(Cents per gallon)

States	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	Tax rate Oct. 1, 1951	Net tax receipts for 1950
Alabama																		6	$33,792
Arizona																		5	10,400
Arkansas																		6½	23,900
California													1½					4½	138,100
Colorado													2					6	21,100
Connecticut	1												1					4	19,400
Delaware	1														1			5	4,472
Florida																		7	54,154
Georgia															1		—1	6	53,200
Idaho											1							6	10,600
Illinois																	1	4	59,773
Indiana																		4	42,520
Iowa											1							4	28,228
Kansas												1			1			5	28,600
Kentucky														2				7	38,000
Louisiana		2												2				9	46,414
Maine													2					6	12,839
Maryland													1					5	24,524
Massachusetts																	1.3	4.3	27,400
Michigan																	1½	4½	48,563
Minnesota			1			—1	1								1			5	34,900
Mississippi																1		7	24,951
Missouri																		2	20,405
Montana															1			6	10,700
Nebraska			1												1	—1		5	23,951
Nevada															1½			5½	2,700
N. Hampshire																	1	5	5,124
New Jersey																		3	35,529
New Mexico															2		—1	6	14,370
New York	1	—1	1															4	91,600
N. Carolina															1			7	59,600
N. Dakota					1												1	5	5,243
Ohio																		4	81,900
Oklahoma							1½				2		—2		1			6½	38,200
Oregon															1			6	27,202
Pennsylvania	1														1			5	106,500
Rhode Island			1										1					4	6,400
S. Carolina																1		7	28,421
S. Dakota																	1	5	6,200
Tennessee																		7	43,942
Texas																		4	93,216
Utah																	1	5	7,900
Vermont													1½		½			5	4,850
Virginia												1						6	44,800
Washington															1½			6½	40,127
W. Virginia			1															5	17,900
Wisconsin																		4	33,000
Wyoming																	1	5	5,100
D. of C.									1					1				4	7,800
Total	4	1	5	0	1	0	2	1	0	0	3	2	8	2	14	2	8	5.27 (avg.)	$1,648,510

This table shows taxes levied by states during the past 17 years. The figure at the bottom of the tax-rate column is the unweighted average of all states. It may be noted that on only six occasions in the 17 years shown was a state tax reduced. In most cases, these represented the expiration of a temporary tax. As shown in the table, Louisiana's 9-cent tax still is the highest in the nation. Biggest income is produced by California's 4½-cent tax. Total net tax receipts (last column) compare with a 1948 figure of $1,342,973,000—an increase during the 2-year period of $305,537,000.

Significance.—The public, generally unaware of the rising costs in the petroleum industry and of the controlled prices of its products, is inclined to note the imposition of a new tax with the remark: "Gasoline has gone up."

Rising product prices, even when due solely to increased taxes, always have reflected discredit upon the petroleum industry in the eyes of a large segment of the consuming public, which judges the industry by the pump price of gasoline. The increasing taxes, therefore, add tremendously to the public-relations problem of the entire petroleum industry.

At present gasoline prices, the public pays roughly a third of its gasoline dollar to the Government as taxes. Figured on a sales-tax basis and using the 50-city average price on house-brand gasoline of one major company, motorists on October 1 were paying a sales-tax equivalent of 33.7 per cent. The 50 cities include one in each state, the District of Columbia, and a separate price for New York City.

Fact and prospects.—Of the eight states which so far this year have boosted their taxes on gasoline, six raised the ante by 1 cent a gallon. These are New Hampshire, North Dakota, South Dakota, Utah, Wyoming, and Illinois.

Michigan increased its tax 1.5 cents per gallon, and Massachusetts wound up with a compromise of 1.3 cents per gallon. Two states, Georgia and New Mexico, actually reduced the state tax this year by a cent a gallon.

Missouri is the only state at present in which the question of a gasoline-tax increase is under discussion. Here two bills are in the hopper, one providing a 1-cent increase and the other a 2-cent boost.

If either is passed, it will strip the state of the distinction of having the lowest tax in the nation, at present 2

cents per gallon. It is, however, one of those states permitting counties or municipalities to levy motor-fuel taxes.

County and municipal taxes levied in addition to federal and state taxes range from a low of 0.2 cent per gallon in Pilot Grove, Mo., to 3 cents a gallon collected by Hancock County, Mississippi. Other states permitting taxation on the local level are Alabama, Florida, Nevada, New Mexico, and Wyoming.

While the trend has been steadily upward since 1945, no big boost is expected in 1952, since that is an off year for state legislatures. It may be noted in the accompanying table that major increases generally are voted in odd-numbered years.

As a rule, taxes in the major gasoline-consuming states are lower than those in less populated states. This results in a weighted average tax which is lower than the average state tax shown in the small accompanying table.

The weighted average state tax is figured using the gallonage sold at each tax rate. In 1949 the weighted average for the United States was 4.52 cents per gallon. In 1950 it rose to 4.65. A weighted average for 1951 cannot be determined until figures become available on total gasoline sales in each state.

TREND IN STATE GASOLINE TAXES
(Average rate on January 1, cents per gal.)

1941	4.36
1942	4.41
1943	4.43
1944	4.43
1945	4.43
1946	4.51
1947	4.55
1948	4.71
1949	4.90
1950	5.11
1951	5.23
1951 (October 1)	5.27

MIDWEST

Successful Water Flood

Benton field of Franklin County, Illinois, has produced 1,000,000 bbl. of oil by water flooding within 22 months

Joseph A. Kornfeld

MOUNT VERNON, Ill.—The achievement of producing 1,000,000 bbl. of oil by water flooding within 22 months after the operation started was celebrated here last week by Shell Oil Co.

The flood is in Benton field, in Franklin County near here, which 10 years ago was producing 33,000 bbl. per day and then dropped off to only 730 bbl. per day 2 years ago. Today production is 7,500 bbl. per day and may go to 12,000 bbl. daily.

The Benton water flood is called the largest successful project of its kind, and is cited as an outstanding example of the possibilities of applying secondary-recovery measures to other declining fields in southern Illinois.

WHAT IT TAKES.—This photograph shows the amount of facilities necessary aboveground to carry on a major water-flood program. This is Shell's Benton, Ill., installation.

An unusual feature is that the Tar Springs producing sand, found at a depth of about 2,200 ft., lies 1,400 ft. below an operating coal mine, which necessitated unusual spacing and drilling methods. Some wells run down through the supporting pillars of coal and special casing had to be put into those wells before they could be used for injecting water into the oil sands.

Water flooding was started at Benton at the end of 1949, and up to that time the field had yielded about 20,000,000 bbl. of crude and was estimated to produce an additional 6,000,000 bbl. by primary-production methods. Water flooding is expected to produce 21,000,000 bbl. over a 17-year life of the operation, thus adding 15,000,000 bbl. to Benton's producible reserves.

Unit operation.—Although secondary-recovery possibilities were recognized early in the life of Benton field, serious consideration was not given to water flooding until the early part of 1947. At that time Shell Oil Co., through the acquisition of additional properties, has assembled a block of producing acreage of sufficient extent to justify a secondary-recovery program. However, a concentrated effort was made to interest the remaining operators in the project as initially installed which covered about 90 per cent of the productive area. Extension of the unit to include the remainder of the field was effective June 1, 1951.

Shell Oil Co. is operator for itself and three other firms, W. C. McBride, Inc., J. W. Menhall, and Burr Oil Co.

Water to the injection wells is delivered at pressures up to 600 psi. by a central pump station through a 2⅜-mile network of cement-lined steel pipe to a series of 103 injection wells. Produced water from 137 oil wells is returned to a central point in the field through a 16-mile network of asbestos-cement pipe.

Wide spacing.—Water-flood projects developed in Illinois prior to Benton were drilled on a relatively close spacing pattern either by drilling of infill wells or by completely redrilling a field. However, infilling operations were not feasible at Benton because of the coal mine 600 ft. below the surface. Therefore, it was decided to convert alternate existing 10-acre wells from oil wells to water-injection wells, which would, in effect, create a 20-acre five-spot pattern.

Mine protection.—Another problem related to the existence of the coal mine and unique in water flooding operations was that of coal mine protection. To insure that the personnel and operations of the Chicago, Wilmington & Franklin Coal Co. would be safeguarded, it was agreed to limit the surface injection pressures to 1,000 psi.

Imports Row Heightens

Tariff Commission hears from all sides in argument over elimination of present oil-imports quota, cut in tax

Bertram F. Linz

WASHINGTON.—Following a 3-day hearing before the Tariff Commission, the fight over elimination of the present quota on oil imports and reduction of the import tax moved over this week to the Committee for Reciprocity Information, which is scheduled to report to the State Department in the near future whether any concessions on tax or quota should be considered in the negotiation of a new reciprocal trade agreement with Venezuela.

Spokesmen for the importing companies and the domestic marketers contend that the quota restrictions can be eliminated and the present 10½-cent tax on crude and heavy fuel oil cut to 5¼ cents per barrel without injury to the domestic industry.

Representatives of the Independent Petroleum Association of America and leaders of the coal industry, on the other hand, urged that not only should the quota system and present rate of tax be retained but that, if possible, the tax should be increased.

Higher labor costs.—Testimony of importing company officials before the Tariff Commission showed that, taking into consideration the schools, housing, commissaries, and other benefits which companies operating in Venezuela are required by law to provide, the labor cost in Venezuela is 50 per cent above that in the United States.

While they admitted that the benefit from a further reduction in the tax would go to the Venezuelan Government and the producing companies in that country, they held that such action would do much to improve relations between the United States and Venezuela and in the long run benefit consumers here because, they said, the domestic producers are going to find it difficult to keep up with demand.

Stable policy needed. — Company spokesmen emphasized the need for a stable import policy to encourage development abroad, and S. A. Swensrud, president of Gulf Oil Corp., told the commission domestic demand will hit the 10,000,000-bbl.-per-day mark by 1960 and will be around 9,000,000 bbl. by 1955, when imports of 1,436,000 bbl. per day will be necessary.

All of the company officials assured the commission their import plans were designed to supplement but not supplant domestic production, and that a quota on imports would be harmful. They stressed the fact that they have extensive domestic production which would be affected, as well as other output, by any unnecessarily large imports.

No "cheap" oil.—With world demand easily keeping pace with production, Robert H. Colley, president of Atlantic Refining Co., said, the day of "cheap oil" is passing and even today there is no such thing as "cheap" imported oil.

The importing companies subscribe to the National Petroleum Council import policy, the commission was assured. As summed up by M. J. Rathbone, Standard Oil Co. (N. J.) director, "Jersey and other importing companies have important investments in the oil business both at home and abroad. In view of the substantial investment which we have in the domestic oil industry, it obviously would not be to our own interest to increase imports of crude so as to damage the domestic industry."

Rathbone anticipated the coal industry's demand for restrictions on residual fuel imports used by utility plants on the East Coast, denying that coal has been displaced by oil but that, rather, the demand for coal has failed to keep pace with a rapidly expanding total energy market.

Venezuela's view. — The Venezuelan viewpoint was expressed by Arthur T. Proudfit, president of Creole Petroleum Co., who has been in that country for more than 20 years.

Proudfit testified that the $333,000,000 paid in taxes and royalties last year by the 15 oil companies operating in Venezuela amounted to 58.7 per cent of the government's total revenues.

"It is evident that the economy of Venezuela is directly dependent upon the health of the Venezuelan petroleum industry," Proudfit said.

"Since the petroleum industry is a predominant factor in the Venezuelan economy, it is quite apparent that restrictive duties imposed on its production will have a serious effect on that economy as well as on Venezuela's ability to continue as a major importer of United States products."

Proudfit, as well as other witnesses, warned that quotas and excessive duties will tend to force Venezuelan producers to seek markets elsewhere to the possible detriment of our economy and national security in the event of domestic shortages.

Importers' view. — Summing up the position of the importing companies, Charles L. Harding, Socony-Vacuum director, said imports are vitally necessary to supplement domestic supplies to meet ever-increasing demand and maintain a prudent margin of excess crude producibility; foreign reserves held by United States companies are essential to our welfare and security; sound trade relationships should be preserved, especially with countries where United States oil concessions are located; the recent increase in rates through reimposition of the quota has been prejudicial to our trade relations, and a reduction in the tax does not threaten serious injury to either the domestic petroleum or coal industries.

I.P.A.A. argument. — Presenting the argument of the I.P.A.A., Russell B. Brown, general counsel, charged that the interest of the importers who had te tified was "a direct and immediate financial gain," and renewed his charge that through imports, "a few companies are enhancing their power to dominate the industry within the United States."

Brown challenged the importers' claim that the trade-agreements program has not injured the domestic industry and asserted that injurious effects threaten to recur with increasing force in the future as a result of existing concessions, "the threat being obscured by temporary abnormal conditions."

The threat of injury to domestic producers through elimination of the quota was demonstrated in 1949-50 when uncontrolled imports resulted in a severe curtailment of production and prices in heavy-crude fields declined appreciably, Brown said. He placed the loss to producers at more than $500,000,000.

Any increase in imports, Brown contended, makes the United States increasingly dependent upon foreign oil and the import figures provide a basis for charges that the domestic industry cannot find sufficient new reserves to support expanding demand, even though Petroleum Administration studies show there is "impressive evidence" to the contrary.

Only temporary. — Brown explained that at the moment the mobilization effort has resulted in abnormal increases in oil consumption and in steel shortages that impede the industry's expansion efforts, a situation magnified by the loss of Iranian oil. But this is a temporary situation which should not be permitted to form a basis for long-range policies, he said.

"Any slackening of industrial activity and/or return of Iranian oil to the world market could result in a rapid change to another period of world oil surplus," he warned. "Some practical safeguard in our foreign-trade program to prevent the destructive effects of such a surplus upon the domestic industry should be provided.

"In the interests not only of sound national policy but also of equity, provisions should be made to prevent the destructive effect of excess oil supplies from falling upon the oil industry in this country—or in any other country. . . . There is neither a need nor justification for further reduction or concessions as to petroleum import duties."

Tax no deterrent.—Brown took the position that the present tax is no deterrent to importations, pointing out that when the 21-cent tax was adopted in 1932 the average price of crude was 87 cents a barrel and the tax amounted to 24 per cent of the domestic price. The current price is $2.56 per barrel and to reach the 1932 rate the import tax would have to be approximately 60 cents per barrel.

Brown urged the commission to "establish a firm policy of encouraging the maximum development of petroleum within the United States to meet the expanding requirements of our economy and national security" and correct the "recent trend of growing dependency on foreign oil."

Under no circumstances, he said, should the present tax be reduced but, rather, the Government should increase the taxes on imports of crude and products "within the limits of the law, to the point of equal competitive relationship" and establish such other limitations as are necessary to assure an equitable control of imports when needed.

Cites inequity.—Brown also said there is an inequity in the present import-tax policy granting kerosine and certain other products a lower import tax than crude. This is due to the fact that the General Agreement on Tariffs and Trade provides that in no event shall the tax on topped crude and fuel oil be less than the rate on crude but freezes the tax on kerosine at the 10½ cents per barrel rate.

Tanker Supply Satisfactory

WASHINGTON. — Representatives of the tanker industry have told Office of Price Stabilization officials that the tanker supply is such that domestic trade can be satisfactorily supplied without a tailored pricing regulation for the industry.

OPS officials agreed with industry representatives that it would be impractical at this time to issue a specific regulation on tanker rates, now controlled by the General Ceiling Price Regulation.

It was pointed out that without adequate controls on world-wide trade or resort by the Government to the requisitioning of ships, specific controls in domestic coastwise trade would tend to jeopardize the supply of ships for domestic operations.

Industry spokesmen contended the GCPR is inequitable because of the variety of rates prevailing at the time of the freeze last January, but it was pointed out to them that the regulation does provide for adjustments under certain conditions.

Tank Cars Adequate

Only spot shortages seen in peak-demand periods

WASHINGTON.—The petroleum tank-car supply this winter will be adequate to meet the general needs of the oil industry, according to a survey by Defense Transport Administration officials.

Nevertheless, it is admitted, some shortages will be experienced in periods of peak demand.

As a result of the survey, the DTA is sending a questionnaire to all companies operating 100 tank cars or more for chemical and miscellaneous products as well as petroleum transportation, requesting monthly reports on the number of cars owned, the number in actual use, the number of bad-order cars and extent of repairs under way, the number of cars scrapped, and the number held for dismantling.

The purpose of these reports is to assist DTA in its work as a claimant agency to get materials for maintenance and repair of cars, expedite the repair of bad-order cars so as to get them back into use promptly, and encourage the prompt breaking down of cars to be scrapped as an aid to the scrap drive.

Warning voiced.—While the transport agency found the tank-car situation generally satisfactory, it warned operators that "the possibility of a tank-car shortage this coming winter makes it necessary for the number of bad-order tank cars to be held to the absolute minimum."

The DTA survey was made for Administrator James K. Knudson by R. H. Lamberton, special consultant on liquid transport.

Lamberton held that enough tank cars will be available to meet the expanding defense needs, despite the fact that production is from 3 to 5 months behind schedule because of an inadequate supply of steel.

A total of 3,445 new cars have been delivered since January 1, about half of them for petroleum service, Lamberton reported. As of September 1, there were 9,540 cars on order undelivered. Deliveries so far this year have been more than double the 1,684 delivered in 1950.

Warehouse Order

NPA assures distributors oil goods from steel mills

WASHINGTON. — Warehouse distributors after next January 1 will get at least as much oil country goods from steel mills as they averaged during the period from January 1 to September 30, 1950.

In an order, M-6-A, raising the required monthly shipments to that level from the present requirement of 85 per cent of average monthly base-period shipments, the National Authority provided that, effective immediately, distributor orders for delivery of the minimum product tonnage on and after January 1 must be accepted by the mills.

It was also provided, however, that the 100 per cent is a minimum, not a maximum, and that sales also may be made to warehouse distributors above that figure where they will not conflict with other NPA orders, regulations, directives or directions.

Under the provisions of the Controlled Materials Plan, tickets for steel products may be cashed either at a warehouse or a steel mill. The increase in shipments to warehouses is designed to assure a continuing flow of material to the thousands of small users who traditionally order supplies in less than mill quantity. It is estimated that about 20 per cent of all finished steel-mill products are distributed through warehouses, and 80 to 90 firms handle oil country goods.

Must follow rules.—The new NPA order provides that in obtaining the required tonnages, distributors must place their orders with producers in accordance with lead times established in CMP Regulation No. 1 for specified products. Orders must be for substantially the same products as were supplied to each distributor during the base period, except for minor variations in size and design.

Distributor may limit delivery on ACM (authorized controlled materials) orders from inventory to any one customer at any one destination in a single calendar week to 8,000 lb. of carbon-steel products, 5,000 lb. of alloy-steel products, 2,000 lb. of stainless-steel sheet, 1,000 lb. of stainless-steel bars and plates, and 1,000 lb. or 1,000 ft., whichever is less, of stainless-steel tubing or pipe. In no case is a distributor required to make deliveries to one customer in amounts aggregating 40,000 lb. or more in any calendar week unless the deliveries include 10 or more different items subject to those limitations.

The order also makes provision for the earmarking, if necessary, of particular products in the inventory of a distributor and for directing their shipment to a person designated by a government agency.

Steel Allocations

First-quarter supply may be cut by 1,000,000 tons

WASHINGTON. — First-quarter allocations of steel for the oil industry are expected to be less than 1,750,000 tons, or more than 1,000,000 tons below the allocation for the current quarter.

Petroleum Administration for Defense estimates of the needs of the oil and gas industry called for an allocation of 2,085,000 tons, but the claim was cut first by the Defense Production Administration staff and again by the program - adjustment committee.

Final decision on the allocation may be made by DPA this week.

Meanwhile, PAD officials agreed with Interior Secretary Oscar L. Chapman's statement in addressing the National Press Club here that we should aim at drilling 50,000 wells a year. However, to attain that rate would require 575,000 tons of tubular goods quarterly, some 75,000 tons more than is available.

The value of such development, it was explained, would be in the added margin of producibility which it would give the country.

PAD officials are confident that the 43,400 well target set for this year will be exceeded, possibly by close to 500 wells.

Scrap drive. — Meanwhile, Interior Secretary Oscar L. Chapman is calling on oil and gas operators to give "all-out support" to the iron and steel scrap-collection drive.

Target of the drive is the additional 3,500,000 tons of scrap above earlier estimates which will be needed before the end of the year if the steel industry is to reach its 1951 production goal of 110,000,000 tons.

"The oil and gas industry is one of the largest steel consumers, using about 10 per cent of the country's yearly supply," Chapman said. "For this reason, even though the amount of scrap available from oil and gas operations is relatively small in relation to consumption, the industry has an added responsibility to do its utmost to contribute to the nation's steel scrap pile."

Oil-Lease Deal Questioned

WASHINGTON.—A full investigation of whether certain employes of the St. Louis district of the Farm Credit Administration took advantage of their federal positions to secure oil and gas leases on land in which the federal Government has an interest will be launched by a Senate agriculture subcommittee within a few days.

The purchase of the leases by the FCA employes came to light last year when Congress was considering legislation to sell the mineral rights on such lands to the surface owners. That bill was designed to correct an oversight in legislation adopted in 1946, which provided for the conveyance by the Government to the buyer of a Farmers Home Administration property of the mineral as well as the surface rights but was not made retroactive to lands sold prior to 1946.

The Senate committee went briefly into the matter last year, but did not complete its investigation or submit a report, and it is planned now to go more intensively into it in connection with an investigation of charges of irregularities in the Commodity Credit Corporation grain storage program.

INDUSTRY AFFAIRS

Expansion Moves Ahead

Rapid progress made in enlarging basic refining capacity for output of fuel oils, gasoline, avgas, Wilson reports

WASHINGTON. — An estimated 28 per cent of the $446,000,000 investment certified for accelerated amortization up to June 30 for new oil refining capacity is now in place.

The rapid progress made in expanding basic refining capacity for production of fuel oils and motor gasoline and specialized facilities for aviation gasoline, petrochemicals, and sulfur was noted last week by Defense Mobilizer Charles E. Wilson in this third quarterly report to the President on the progress of the defense program.

However, Wilson pointed out, the new capacity for which certificates of necessity have been issued is only a part of an estimated $1,000,000,000 expansion of the industry aimed at adding refining capacity for 1,000,000 bbl. of products a day by 1953, an increase of 14 per cent.

Wilson's report disclosed that steps are being taken to meet anticipated increases in overseas shipping requirements, both civilian and military, through the construction of merchant vessels of high speed and mobility under a program that includes 26 high-speed tankers.

He reported also that while supplies of natural rubber have not improved, the reactivation of synthetic-rubber plants with a potential capacity of 860,000 tons a year has greatly eased the shortage of most rubber goods. However, he said, there is still a shortage of butyl rubber and it will be necessary to expand capacity for that type.

Looking ahead.—Wilson's report did not attempt to evaluate the future progress of the industry but Petroleum Administration officials were far from sanguine as they looked ahead.

Addressing the Society of Automotive Engineers in New York, Thomas L. Apjohn, assistant director of the refining division, predicted that the materials allotments under which the industry is operating will make it difficult to develop the additional 1,000,000 bbl. daily refining capacity which it aims to have by the end of 1953.

Further, Apjohn said, it is becoming apparent that even the 1,000,000-bbl. program is not big enough to meet all of the emergency situations that may arise in the near future and industry leaders, recognizing that fact, have expressed willingness to carry out the 3-year program in less than 2 years.

"Unfortunately," he commented, "this cannot be accomplished with the presently limited controlled materials. In fact, it is estimated that the materials allotments under which the petroleum industry is operating will make it difficult to meet even the minimum 3-year 1,000,000-bbl. program."

Further, said Apjohn, the effects of present materials limitations on both quantity and quality of future product supply should not be minimized.

"If today petroleum products are not in sufficient supply to take care of the dual demands of a growing economy and mobilization," he warned, "extensive military demand in an all-out emergency can be met only with intolerable reductions in both quantity and quality of civilian products."

Natural gasoline.—Despite materials limitations, however, substantial progress is being made in the expansion of natural-gasoline facilities, Richard P. Walsh, director of the natural-gas-production and processing division, told the California Natural Gasoline Association in Los Angeles.

More than 200 applications for priorities assistance have been approved for the industry by PAD, Walsh said. Twenty completely new natural-gasoline plants and 30 additions to existing plants are among the projects which, when completed, will add approximately 86,000 bbl. of light hydrocarbons to our present

daily production at a cost of approximately $90,000,000.

Other features of the expansion program are the proposals for pipe lines, one of which would move 10,000 to 20,000 bbl. daily into the Chicago area, and projects for underground storage of liquefied petroleum gas. Several storage projects have been approved by PAD which will provide capacity for over 1,000,000 bbl. of propane and butane. Most of these projects are salt-dome or salt-bed washouts near producing plants, but one is an actual mining operation in a consuming area, Walsh said.

Gulf Expanding

Contracts let on biggest cracker and crude still

PHILADELPHIA—Gulf Oil Corp.'s $200,000,000 expansion program begun earlier this year will involve construction of two process units, each the largest of its kind in the world, at the company's refinery here.

The Philadelphia construction, announced by S. A. Swensrud, Gulf president, will boost plant capacity by about 75 per cent (*The Oil and Gas Journal, May 3, 1951, page 157*).

A two-stage atmospheric and vacuum crude distillation unit with a capacity for processing 125,000 bbl. per day will permit the retirement of some existing capacity at the plant and increase total capacity from the present 107,000 bbl. per day to 183,000 bbl. per day.

A second major project will be the construction of a fluid catalytic cracking unit with a capacity rating of 63,000 bbl. per day. This giant plant will exceed in size the 60,000 bbl. per day fluid unit now under construction at the company's Port Arthur, Tex., refinery, now holding the current record for size.

Other construction.—Gulf will also construct at Philadelphia a 10,000-bbl. per day catalytic reforming unit which will be capable of producing benzene, toluene, xylenes, and aviation-gasoline blending components. Final decision as to the type of cat reformer to be built was not announced. It will be the first such unit to be built by Gulf.

A gasoline-treating plant capable of handling 40,000 bbl. per day, a new power plant to make the entire refinery completely self-sustaining, new locker buildings, a refinery laboratory, and a new canteen will be included in the major plant-expansion program. The refinery will have steam-generation capacity for 900,000 lb. and a power capacity of 30,000 kw.

Contracts let.—Contract for the new crude unit has been awarded to Foster Wheeler Corp., New York. This will be the first unit built, and construction is expected to begin this year. M. W. Kellogg Co. will construct the fluid catalytic cracking unit. No further contract awards have been announced.

Company officials attributed the decision to enlarge the Girard Point plant partly to the "favorable civic program of Philadelphia designed to encourage manufacturing expansion in the area." Another basic reason is proximity to eastern markets and the probability that future operations will depend more and more on imported crude.

East's biggest.—The Gulf program will make the Philadelphia refinery the largest along the eastern seaboard and sixth largest in the nation. The 24 deep-water refineries along the East Coast will total 1,152,700 bbl. per day in crude capacity when currently announced expansion programs are completed. Further plans for enlarging eastern refineries are expected later this year.

The Philadelphia project is expected to be completed by early 1953. Gulf's current expansion program brings the company's postwar expansion bill to over $1,000,000,000, which exceeds by approximately 60 per cent the company's net earnings during the same period.

Pure to Enlarge Refinery

PORT ARTHUR.—Construction will soon begin on an expansion program at Pure Oil Co.'s Smith Bluff refinery, according to C. W. Cooper, refinery manager.

The three-part major installation will consist of a new fluid catalytic cracking unit, a catalytic polymerization unit and substantial enlargement of alkylation facilities at the 55,000-bbl. plant.

The major portion of the new facilities will be constructed by M. W. Kellogg Co., while other contractors will work on associated parts of the expansion program, which will include cooling towers, water facilities, electric services, steam services, and other utility phases.

The program will basically surround the new catalytic cracking unit, Cooper said. The new cat cracker will be an Orthoflow fluid unit with charge capacities in excess of 26,000 bbl. per day. The battery limits of the cracker will include the unit's gas-recovery system and that of the poly unit. The conversion of stocks in the cat unit will provide substantially greater feed stocks for the production of alkylate and synthetic rubber.

Plans call for the building of a new feed-preparation unit which will have a vacuum flash section of approximately 20,000 bbl. daily. Present facilities at Smiths Bluff include 12,500 bbl. thermal cracking capacity and a 9,800-bbl. thermofor catalytic cracking unit.

Oil Progress Week

Varied celebrations set for October 14-20 period

WIDESPREAD participation of Oil Progress Week activities by oil men throughout the country was anticipated by officials of the American Petroleum Institute as many communities started observance ahead of the official dates of October 14-20.

Activities which were successful in telling the story of oil in many cities last year are being repeated and expanded in others this year, and the reports of planned events indicated wider participation by all branches of the petroleum industry, greater enthusiasm, and more advance preparation than in prior years.

In many places advantage was taken of local events to start Oil Progress Week ahead of schedule. Typical was Hays, Kans., where a congress of state high school bands provided a parade and mass meeting. Here the city, in a voluntary gesture, presented a plaque to the oil industry in appreciation of the assistance given by oil companies during last summer's flood when oil men furnished crews and equipment to pump out cellars, rescue the stranded, and assist in relief and rehabilitation work.

Theme.—The theme of Oil Progress Week everywhere is reporting to the public on how the industry functions and what its progress means to consumers and to better living. The devices used for accomplishing this are as varied as the number of local committees engaged in it.

The activities range from speeches and movies to parades and beauty contests, and include barbecues, school programs, open house at oil installations, radio programs, newspaper advertising, window displays, street decorations, billboard posters, essay contests, and many others.

Most of the industry's top-drawer speakers will be kept busy throughout the week making talks at luncheons and other gatherings, and virtually every company in or connected with the oil industry is participating in observance of the week. Preliminary reports indicate that several hundred thousand men and women in the oil business, from production to marketing, will take part in local community programs during Oil Progress Week this year.

The Oil Industry Information Committee, which heads up the public-relations work, is assisting local groups with literature, suggestions, and speaker lists, but the planning and execution of the week's activities are all in the hands of local committees, as the distinguishing characteristic of the campaign is the development of public relations at the community level.

How to Produce More Oil

Better methods of reservoir engineering, secondary recovery highlight discussion at A.I.M.E. meeting

Walter Rose

OKLAHOMA CITY.—Getting more oil out of the ground by better methods of reservoir engineering and secondary-recovery processes was the subject of greatest discussion at the annual meeting of the petroleum branch of the American Institute of Mining and Metallurgical Engineers here October 3-5.

The growing realization in the industry that ways to minimize the amount of oil left in a field is as important as discovering new oil was demonstrated by the fact that two-thirds of the 34 engineering papers at this meeting dealt with some phase of reservoir engineering. The more than 1,000 engineers in attendance spent more time in discussing this general subject than in any other part of the program.

Mobility ratio.—How little is actually known about the mechanics of water flooding was shown by the discussion given a paper by J. S. Aronofsky of Magnolia Petroleum Co., Dallas. He declared that greater attention should be given to the mobility ratio, which compares the ease with which the reservoir formation yields the produced oil to the ease with which the reservoir permits the entry and advance of the flooding water.

His experiments, he reported, clearly show that mobility ratio is an important factor in secondary recovery, and that recovery of oil is greatest when the flooding phase has a lower mobility than the flooded oil.

Discussion brought out that the same rule apparently holds in flooding patterns other than that described by Aronofsky, although some disagreement was apparent. Questions left unsettled included the maximum breakthrough recovery to be expected in a five-spot flood, and the need for evaluating the effect of mobility ratio on recovery after breakthrough.

Water flooding.—A unique treatment of the performance of a five-spot flood to show the recovery to be anticipated was described by William Hurst of Petroleum Consultants, Houston, who suggested that the new analytical technique would be generally applicable to other flood patterns. Other schemes by which performance and recovery of water floods may be evaluated were offered by Loyd R. Kern of Atlantic Refining Co., and Henry J. Welge of Carter Oil Co.

The possibility of cycling deep depleted reservoirs was advocated by Donald L. Katz of the University of Michigan, who suggested compression to a single phase to achieve recovery of oil which otherwise would be lost, a suggestion closely related to other recent papers on this subject.

Edgewater intrusion, while depending on withdrawal rate, need not be adversely affected in practice by reasonable variations in rate, it was reported in a paper prepared by Morris Muskat of Gulf Oil Corp., Pittsburg.

Closely bearing on water flooding problems was a paper by engineers of Stanolind Oil & Gas Co. which showed that residual gas saturations in reservoirs produced by liquid flooding are higher than previously supposed. Data obtained by Stanolind laboratory tests and from field tests where residual gas saturations were measured directly in watered-out sands showed values of 15 to 50 per cent more pore space, or approximately the range of residual oil saturations commonly reported.

Field operations.—Appraisal of field conditions was dealt with more directly in several other papers. One by engineers of Phillips Petroleum Co. concluded that permeability profiles obtained from core analysis may not accurately describe reservoir lithology, and a report on work of Atlantic Refining Co. gave valuable reference material on the effect of data errors on typical reservoir-engineering calculations.

Other reports on field studies included a reservoir analysis of the Woodbine basin showing the influence of Woodbine production on performance of East Texas field; success of the gas-injection project at Cedar Lake field; low-pressure gas injection at Cook Ranch field; and development and performance of Poza Rica field in Mexico.

Laboratory techniques.—Procedures for obtaining basic reservoir-engineering information were discussed in a number of papers, which described a laboratory method for evaluating the wettability of reservoir rocks; new information on the evaporation method for determining connate water; a technique for making visual examination of the flow characteristics in the pores of simulated reservoir formations; and the advantages which the Fluid Mapper model technique holds over the more widely used potentiometric model.

Digests of all papers on reservoir engineering, as well as those on logging, drilling, completion, and other practices, presented at the A.I.M.E. meeting are printed in this issue of The Oil and Gas Journal, beginning on page 123.

New Shot Method

Vertical use of shaped charge for gassers safer

PITTSBURGH.—Use of the shaped charge for vertical shooting of high-pressure natural-gas wells has contributed greatly toward eliminating fire and injury hazards, New York State Natural Gas Corp., which developed the technique, reports.

The innovation marks a forward step in gas conservation also, since it substitutes blasting for the older method of using tools that often fly out of a well into the rig under intense pressure, causing sparks which set off costly and dangerous gas-consuming fires.

Edward C. Inghram, superintendent of production and storage for the gas company, first conceived the idea of using the shaped charge for vertical penetration of the cap rock

SAFER SHOOTING.—Charles E. Altman, assistant superintendent of the Tioga district for New York State Natural Gas Corp., examines the shaped-charge apparatus used in Clinton County, Pennsylvania, to shoot high-pressure gas wells. The new technique substitutes blasting, thus eliminating dangers of tools being blown from the hole.

above high-pressure gas wells. He shares credit with E. H. Williamson, assistant superintendent of production and transmission for Peoples Natural Gas Co. The two worked out details for the first successful experiment in Leidy gas field.

New York State Natural is now using the method almost exclusively in wells drilled in Clinton County, Pennsylvania, gas field, and anticipations are that use will soon spread to other areas.

The shaped charge is not new and has been employed in various ways, including horizontal shooting in gas wells. But, it was never successfully used vertically in bringing in a new gas well.

How it works.—As a well is drilled it is correlated by logging or coring methods with other wells in the vicinity so that drilling may be stopped in the cap rock immediately above the high-pressure pay sand. Drilling equipment is then removed from the hole and a prepared shaped charge is lowered to the bottom of the well by means of a "shooter's line," or preferably, a parachute-like umbrella.

The explosive agent, which is activated by a timing arrangement, is detonated after it reaches the bottom of the well. Force of the downward-directed blast causes the jet to penetrate the cap rock. The well is thus brought in without hazard of tools being blown out of the hole.

Explosive.—The shaped charge, which has a Cyclonite base, is composed of 10 lb. of a slow-burning, gelatin-like powder, the equivalent of $2\frac{1}{2}$ qt. of nitroglycerine.

The explosive agent is made in the form of an inverted cone. Downward force of the blast, which has the effect of turning the cone wrong-side out, has a velocity of 14 m.p.s., and causes a downward penetration through rock of approximately 4 ft. It can be detonated either with a Bolshevik bomb or the newer improved Zero Hour bomb which is currently being used.

WEST COAST

Gas Priced Too Low

Fuel valued below actual present or replaceable worth when judged from original cost formulas, C.N.G.A. told

D. H. Stormont

LOS ANGELES.—"Because of price precedents set 25 years ago—when the hunt was for demand and not for supply—natural gas is being valued away below its actual present or replaceable worth when judged from the basis of 'original cost' formulas. . . . From the objective and historic point of view, undervaluing a nonreplaceable natural resource can be just as wasteful as burning it in torches."

This thought was expressed by T. S. Petersen, president of Standard Oil Co. of California, in his address on "Natural Gasoline and Petroleum Progress" before last week's annual meeting of the California Natural Gasoline Association.

Specifically he was dealing with the over-all economic value of natural gas, which he declared was of vital importance to the natural-gasoline business because of the necessity of protecting natural-gas resources.

He pointed out that today only about 30 per cent of the natural gas being consumed is for home use, with 9 per cent going to commercial shops and the remaining 61 per cent to industry. To view the future realistically, home use should have the priority to fill all its demands he stated, adding:

"Proper pricing should insure that industry not use too much of this fuel to deplete the amount available for more valuable home use. In this use, as natural gas adds to our standard of living, we should be willing to pay for it at a price nearer to its actual value and its relationship to other fuels."

Other problems.—Touching on other problems of the industry, Petersen said one of the most difficult is that of bringing all-year operations to a fairly constant level. Some of the demand valleys could be leveled out, he said, by increased use of propane in heavy-duty internal-combustion engines, in agricultural equipment, and in processing of farm products, and in kiln drying of lumber, brick manufacturing, and other such industrial uses.

Underground L.P.G. storage.—Insofar as underground storage is concerned, Petersen stated California Standard has authorized a study to see how the practice will work in California subsurface structures. Costs of aboveground storage to accomplish a carryover of propane, he said, are prohibitive—"as an example, a 42,000-gal. propane tank costs about $30,000 or about 71 cents a gallon."

This subject also was discussed by R. P. Walsh, director of the natural-gas-production and processing division of Petroleum Administration for Defense. In the past year, he said, projects with capacities for storing more than 1,000,000 bbl. of light-hydrocarbon liquids in salt domes, salt-bed washouts, and other underground reservoirs had been processed by the division.

In describing the role of the division in aiding natural-gasoline manufacturers to obtain construction materials, Walsh stated applications for 86,000 bbl. of new plant capacity have been handled. Involving expenditures totaling $90,000,000, this new capacity, he said, was in the form of 20 new plants and 30 substantial enlargements to existing plants.

ROCKY MOUNTAIN

Williston Well Finds Oil

Another wildcat in the Williston basin of the Dakotas, eastern Montana, and southern Saskatchewan, has found oil.

Shell Oil Co. 1 Pine unit, SW SW NE 30-12n-57e, Wibaux County, Montana, recovered 370 ft. of 29.4°-gravity oil and 180 ft. of oily, gasy mud on a 55-minute drill-stem test at 8,924-75 ft.

The indicated producing formation has not yet been announced but regional geology indicates that it is probably Lower Devonian or Upper Ordovician. Shell has reported the following tops in this interesting wildcat: Upper Mississippian-Charles at 7,100 ft., Lower Mississippian-Mission Canyon at 7,565 ft., and basal Mississippian-Lodgepole at 7,976 ft.

This wildcat, which has reported several apparently noncommercial shows of oil higher in the hole, is located 75 miles southeast of Shell's Richey wildcat which tested oil in the Charles and is now drilling below 9,410 ft.

The Texas Co. 1 NPRR "B," 35-15n-54e, about 20 miles northwest of the Shell well and also on the Baker-Glendive anticline, is drilling below 8,403 ft. This wildcat is now probably cutting Devonian.

Over in North Dakota Amerada Petroleum Corp. is drilling for the Devonian below 9,295 ft. at 1 Bakken, 12-157n-95w, which found oil in Mississippian rocks at 8,304-60 ft. Another Amerada wildcat, the 1 Binhomer-Risser, 12-149n-96w, called the top of the Spearfish at 6,685 ft. and is currently drilling below 8,059 ft. The 1 Bakken is 12 miles north of the 1 Iverson, North Dakota's initial discovery, and the 1 Binhomer-Risser is 35 miles south.

Shell 1 Homme, 13-20n-12e, Perkins County, South Dakota, called the top of the Devonian at 7,435 ft. On a drill-stem test at 7,559-7,660 ft. recovered 1,500 ft. of mud-cut salty water in 3 hours. This wildcat is drilling below 7,742 ft.

Spraberry Study

Future development of vast trend in West Texas may hinge on decisions to be made at Midland meetings

Roy F. Carlson

MIDLAND, Tex.—Operators in the Spraberry trend have their eyes on Midland this week and next where two meetings promise to have an important bearing on the trend of development in this extensive and puzzling sand.

A temporary program for developing newer areas of the trend on the basis of 80-acre proration units was presented to all interested operators, following its drafting by a nine-man committee in Fort Worth last week. Its objective is to make the best utilization of the limited quantities of steel which the Petroleum Administration for Defense proposes to make available for Spraberry drilling *(The Oil and Gas Journal, October 4, 1951, page 150)*.

Symposium scheduled.—All Spraberry operators are invited to Midland again October 19 and 20 for a conference on drilling and producing problems sponsored by the Texas Petroleum Research Committee.

This 2-day symposium on the peculiar characteristics of the Spraberry sand will be a pooling of the experience of many operators, and is designed to clarify a number of the problems encountered in drilling and completion and to throw light on the probable productivity of the reservoir.

Selected committees of geologists and engineers have prepared papers on the geology and structure of Spraberry and related subjects. The program includes a session on drilling, casing, and mud problems of the Spraberry, and another on reservoir engineering which will cover core data, reservoir performance, and reservoir-fluid properties. The session on completion practices will include discussions of Hydrafrac, acid-completion techniques, completion by air drilling, and a new method for completing Spraberry wells.

A dinner Friday evening will be addressed by Commissioner William J. Murray, Jr., of the Texas Railroad Commission, and by Dr. Harold N. Fisk of Humble Oil & Refining Co., Houston, who will talk on joint fractures in rocks

Rules proposed.—The operators' meeting this week had before it a draft of a proposed set of field rules for submission to the Texas Railroad Commission.

J. Howard Marshall of Ashland Oil & Refining Co., chairman of the drafting committee, explained that while the proposal was unanimously adopted by his group it did not represent the exact views of any individual member. The draft, he said, is a reasonable compromise of conflicting points of view after consideration of the present shortages of critical materials, possible pipe-line proration, the position of land owners and small operators, the prevention of waste, and the protection of correlative rights.

Asks adoption.—The committee's proposal was that the Railroad Commission adopt the following rules for Spraberry development:

Wells may be drilled on a 40-acre or an 80-acre spacing pattern at the option of the operator, and the Railroad Commission's steel-conservation order shall not apply to a well drilled on a 40-acre pattern.

The proration unit shall be 80 acres.

The allocation formula shall be 50 per cent to acreage and 50 per cent to well, and the allowable of a well drilled on a 40-acre spacing pattern shall be calculated on the basis of such formula; provided, however:

1. Each well which, on the effective date of this order, has been completed as a producing oil well or is in the process of being drilled and is located on a 40-acre spacing pattern, and each well thereafter drilled on an adjoining tract under separate lease ownership of record October 1, 1951, and on a 40-acre spacing pattern as a direct offset thereto, or as a direct offset to a well drilled on a 40-acre spacing pattern in a Spraberry area to which this allocation and spacing rule is not applicable, shall have an allowable of the same number of barrels of oil per day as one well producing from an 80-acre proration unit; and,

2. A well drilled on a lease of record on October 1, 1951, and covering less than 80 acres of land, but not less than 40 acres of land, shall have an allowable of the same number of barrels per day as one well producing from an 80-acre proration unit; and,

3. Each well drilled after the effective date of this order on an adjoining tract under separate lease ownership of record October 1, 1951, and on a 40-acre spacing pattern as a direct offset to a well coming within the provisions of (1) or (2) above, shall have an allowable of the same number of barrels of oil per day as one well producing from an 80-acre proration unit.

When the average calendar-day allowable per well of two wells on 80-acre units to which top allowables are assigned is reduced to 50 bbl. or less per calendar day, the allocation formula shall be 100 per cent well.

These rules shall apply only to the Spraberry area in Midland, Glasscock, Upton, Crockett, and Reagan counties, Texas, lying south of the south line of Township 3 South in Midland and Glasscock counties.

Temporary.—This order shall be a temporary order for 6 months' duration, and the presently existing rules affecting the area subject to this order shall again be in effect at the expiration of the 6 months unless further action is taken at that time to extend the effective period of these temporary rules.

50,000 Wells in 1952?

Industry may be asked to drill that many, Texans surmise as Chapman reveals efforts to get more steel for program

F. Lawrence Resen

BEAUMONT.—The prospect that the oil industry may be asked to drill many additional wells next year—perhaps totaling upwards of 50,000—was discussed by oil men attending the annual meeting of the Texas Mid-Continent Oil and Gas Association here October 8-9 as the result of an address by Secretary of the Interior Oscar L. Chapman.

Chapman pointed to the coming need for additional oil production and discussed at length the efforts of the Petroleum Administration for Defense to obtain higher allocations of steel for drilling as well as for other branches of the petroleum industry. The tone of his remarks left the impression that the oil industry may get more steel in 1952 than is now programed for it by the National Production Authority and the Defense Production Administration.

Speaking at the dedication of the Anthony L. Lucas Engineering Building at Lamar State College of Technology during the association meet-

ing. Chapman said there has been an alarming decline in the country's excess capacity to produce crude, a drop from over 1,000,000 bbl. per day in mid-1950 to about half that amount today.

Using more oil.—The increased demands by the Military have also been matched by an increase in civilian consumption to where we are now using more than one-third more oil in this country today than was used at the peak of World War II, and the demand is rising day by day, the secretary said.

Forecasts by the Petroleum Administration for Defense, which Chapman heads, indicate that over the next 5 years the United States will be able to step up its domestic productive capacity by nearly 250,000 bbl. per day annually, he said. These estimates assume that enough materials will be made available as they are needed by the producers, but materials have proved the main obstacle in drilling wells fast enough to keep up with the increased demand.

Original goal raised.—Chapman said that the original goal of 43,400 new oil and gas wells for 1951 had to be raised to 43,900 and he feels that the producers will meet the revised goal. In fact, he said, they are prepared to drill a considerably larger number of wells than the limited supply of steel will allow.

PAD officials at the meeting said that back when it began to appear that the Iranian situation would mean the loss of its oil to the West, PAD's request for additional allotments of steel from NPA and DPA which would increase the supply of oil-country tubular goods by an immediate 8 per cent was turned down. The additional 20,000-25,000 tons under this program represents the amount of mill capacity available for tubular goods, but which has not been allocated because of the national steel shortage. The 8 per cent increase, plus more which PAD would like to see, raised the conjecture of 50,000 wells.

If the increase were immediately available, it would mean an annual production of 48,490 wells starting in the first quarter of 1952. The reaction of NPA and DPA was to deny this request from PAD, but Chapman stated that somehow, sooner or later, we would lick these material problems.

Cites goal.—Chapman stated that the goal of PAD was to open up new reserves and said that the stimulation of the wildcatting program has seen wildcat operations increase more than 26 per cent above a year ago. With the shortage of tubing and casing, restrictions have had to be set up so that in such places as the Spraberry only one well is being drilled per 80 acres in each quarter.

Such limitations keep the full potentialities of the new areas hidden, he said. And ahead are the possibilities of the Williston basin and those of the Rocky Mountain area where development has been held back by the cost of development, exploration, and transportation.

R. F. WINDFOHR
New Association President

PAD's job.—PAD's job is to see that the petroleum situation does not get out of balance as seen in the transportation picture at the present time where 300,000 bbl. per day of producible crude oil is backed up in the West Texas-New Mexico Basin because there is no pipe line to carry it, and another 100,000 bbl. is locked in the Rocky Mountain area for the same reason.

A request for 1.5 million tons of steel for new pipe-line facilities has only been partially filled with only 600,000 tons being made available for the highest priority projects, he said.

Refining insufficient.—The expansion of the refinery program likewise is important and an initial minimum goal of one million barrels per day of additional refining capacity by the end of 1953 appears now to be insufficient to meet the projected needs. Even with the needed extra refinery capacity, it now appears that the allotments of material so far available to the industry will make it difficult to meet even the minimum goal.

Price controls hit.—A system of rigid price controls in the petroleum industry would inevitably lead to the curtailment of production with its prospects of consumer relations, L. S. Westcoat, president of Pure Oil Co., told the association members.

He called upon members of the industry to help in spreading the word of the excellent job being performed in the face of mounting material shortages and sharply rising demand. Such messages should prevent the spreading of panic among the public which would be an excuse for increasing controls on the industry. The industry has maintained an active exploration, research, and development program which has actually resulted in the cost of gas being less today than in 1926, but it can continue to grow only in a free market economy, he said.

Pure's president was supported in his attack against controls by W. Alton Jones, president of Cities Service Co. and chairman of the board of American Petroleum Institute, who spoke out against increasing government controls which lead into socialism and communism. Jones spoke out strongly against planned economy and the greatly enlarged bureaucracy which are characteristic of totalitarianism being paralleled in the United States today.

A third blast against federal controls came when R. B. Anderson, retiring president of the association, advocated a free, unfederalized educational system with a parallel objective in the maintenance of state sovereignty in the petroleum industry.

Resolution passed.—A resolution passed by the association called on Congress to enact immediate interim tidelands legislation which would validate all contracts made in good faith in leasing of tidelands areas and went on to further ask that Congress enact permanent legislation which would recognize traditional state boundaries on the Continental Shelf and allow for continued development of oil and gas resources there. A second resolution called on gas consumers to rely upon a free competitive economy to develop gas reserves rather than a federal agency which would stifle developments.

New president.—Robert F. Windfohr, independent oil producer, Fort Worth, was elected president of the association, and Harry W. Bass, Dallas independent, was elected vice president of the newly created North Central Texas district.

Arch H. Rowan, Fort Worth independent operator, and J. A. Neath, Houston, vice president of Humble Oil & Refining Co., were presented plaques for distinguished service. The plaques are presented each year to an independent operator and representative of a major company who have made outstanding contributions in the industry. Both Rowan and Neath have been actively engaged in association and industry-wide activities for many years.

Rowan is chairman of the board of Rowan Drilling Co., and Neath, who has been with Humble since 1919, was elected vice president in 1947.

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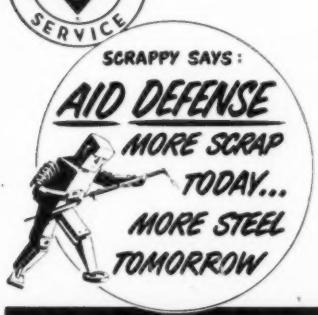

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MEETINGS

A.P.I. Agenda Set

Huge attendance expected at November 5-8 meeting in Chicago; two new symposiums added to regular program

CHICAGO.—The industry's drive for better understanding of the origin of petroleum will be given added impetus at the thirty-first American Petroleum Institute meeting here November 5-8.

Knowledge and theories on the subject will be aired during an open forum, "Research on Occurrence and Recovery of Petroleum." This is the first of two symposiums—new additions to the A.P.I. agenda this year. At the second, oil men will get tips on facility protection (including ports) and personnel security. Effects of plant security on military supply will be discussed.

The oil's-origin forum will be led by Lloyd E. Elkins, chairman, advisory committee, Stanolind Oil & Gas Co., Tulsa. Others taking part will be Dr. Robert E. Wilson, Standard Oil Co. (Ind.); D. H. Clewell, Magnolia Petroleum Co.; C. E. ZoBell and F. P. Shepard, Scripps Institution of Oceanography; W. L. Whitehead, Massachusetts Institute of Technology; A. R. Denison, Amerada Petroleum Corp.; B. H. Sage, California Institute of Technology; C. V. Millikan, Amerada Petroleum Corp.; R. E. Loeck, California Research Corp.; J. A. Putnam, University of California; and Alfred Chatenever, University of Oklahoma.

Among those participating in the petroleum-facilities-protection symposium will be W. R. Boyd, III, director, Facility Security Division, Petroleum Administration for Defense; Ned H. Dearborn, president, National Safety Council; Vice Adm. Merlin O'Neill, commandant, U. S. Coast Guard; and Rear Adm. B. B. Biggs, U. S. Navy, Munitions Board.

Big attendance.—More than 5,000 men in all branches of the industry are expected to attend the meeting. All general and committee sessions will be held at the Stevens Hotel except for the Division of Transportation, which will convene in the Palmer House.

Among special speakers will be Secretary of Interior Oscar L. Chapman, petroleum administrator for defense; Gen. Omar N. Bradley, chairman of the Joint Chiefs of Staff; Gov. Allan Shivers of Texas; Frank M. Porter, A.P.I. president; and the recipient of the A.P.I. gold medal for distinguished achievement. The latter has not been announced.

W. Alton Jones, chairman of the A.P.I. board of directors, and president of Cities Service Co., New York, will preside over both general sessions.

Board meetings.—The A.P.I. board of directors will meet November 6 and 7, and the board of counselors will meet November 6 to nominate candidates for election to the board. Election will take place at the first general session November 7. A new chairman will be elected to succeed Jones, who is now completing the second of the two 1-year terms permitted by the institute's bylaws.

Papers.—Among papers to be presented during the sessions of the production division will be: "The Outlook in the Near East," J. Terry Duce, Arabian American Oil Co., New York; "Development of an A.P.I. Thread Compound," M. G. Mayberry, Mellon Institute of Industrial Research, Pittsburgh; "Importance of Technological Growth as a Contribution to U. S. Productive Capacity," C. E. Reistle, Jr., Humble Oil & Refining Co., Houston; and "Progress in Unitization," H. H. Kaveler, Phillips Petroleum Co., Bartlesville, Okla.

Papers to be delivered at the transportation-division meeting will include: "The Structural Design of Flexible Protective Casings for Pipe Lines," M. G. Spangler, Iowa State College, Ames, Iowa; "Developments in Products Pipe-Line Technology," J. R. Shipley, Standard Oil Co. (Ohio), St. Louis; "Minimizing Pump-Station Fire Hazards," P. D. Phillips and F. O. Stivers, Humble Pipe Line Co., Houston; "Can Contractors Discuss Pipe-Line Construction Contracts?" Richard A. Gump, Pipe-Line Contractors Chapter, Association of General Contractors, Dallas; "Developments in Automatic Gaging, Sampling, and Testing Equipment," F. H. Warren, Ohio Oil Co., Findlay, Ohio; "Developments in Pipe-Line Communications," V. J. Sittel, Service Pipe Line Co., Tulsa; and "Cold-Weather Pipelining," by T. S. Johnston, Interprovincial Pipe Line Co., Toronto.

Joe B. Hudson, of Humble Oil & Refining Co. is general chairman of the convention committee. The A.A.-P.G. program committee is made up of Stanley G. Wissler of Union Oil Co.; R. S. Beck, consultant; and Lowell Redwine of Honolulu Oil Corp. Flint Agee of United Geophysical Co. is program chairman for S.E.G., while Louis J. Simon of The Texas Co. has charge of the S.E.P.M. program.

Pacific Exploration Meet

LOS ANGELES.—The annual meeting of the Pacific sections of the American Association of Petroleum Geologists, Society of Exploration Geophysicists, and Society of Economic Paleontologists and Mineralogists will be held jointly at the Ambassador Hotel here November 1-2. While the program of technical papers to be given is not yet final, it will thoroughly cover recent developments in California fields and exploration techniques.

Geological Group to Meet

AUSTIN.—The South Texas Geological Society, San Antonio, has an outstanding technical program planned for the Regional Meeting of the American Association of Petroleum Geologists to be held here October 18-20.

The first 2 days of the meeting will be devoted to technical sessions during which such well-known geologists as Wallace Pratt, Frank Morgan, Monroe Cheney, and Paul Weaver will present timely papers of widespread interest. Papers on currently developing Texas oil fields and southwest Texas geology are to be given by prominent geologists.

A.G.A. Readies Program

ST. LOUIS.—The American Gas Association's thirty-third convention will get under way here next week, October 15-17.

Program arrangements have been completed except for selection of two general-session speakers.

Departmental meetings are scheduled as follows: Natural and manufactured-gas departments (joint session), October 17; accounting section, October 15; operating section, October 15; industrial and commercial gas section, October 16, and residential gas section, October 15.

Industry Briefs

FORT LEE, N. J.—Socony-Vacuum Oil Co., Inc., has formed a new subsidiary, Socony-Vacuum Overseas Supply Co., to handle several aspects of the parent company's Eastern Hemisphere operations. President of the new firm is Robert Siegel. The company will begin operations about November 1 with offices at 158 Linwood Plaza.

HOUSTON.—Government approval has been granted Shell Chemical Corp. for expansion of facilities for production of ethyl chloride at its plant here. The new plant will consume ethylene originating from Shell Oil Co.'s adjacent refinery, and hydrochloric acid will be produced as a coproduct in a vinyl chloride unit now building at the chemical plant. Chlorine for the vinyl chloride monomer will come from the nearby plant of Diamond Alkali Co.

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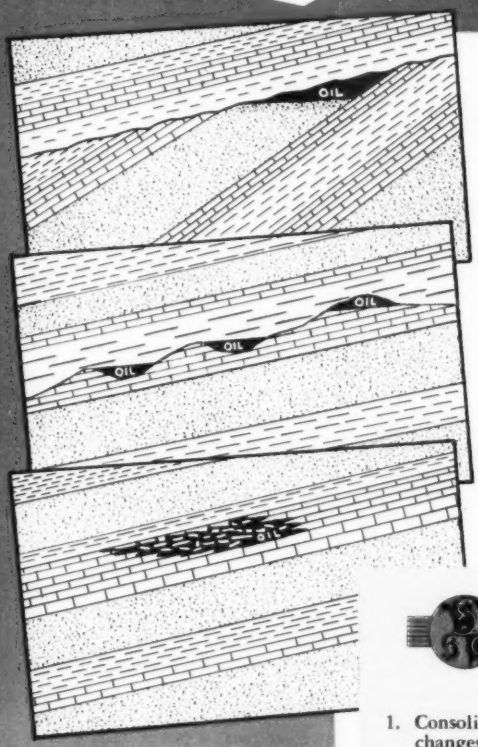


TRUNCATION

Oil or gas accumulation may occur where sand bodies are tilted, truncated and overlain by impervious sediments.
Example — EAST TEXAS FIELD

BURIED RIDGES or ANCIENT TOPOGRAPHIC HIGHS

Stratigraphic accumulations are often found in depressions on such features, or in weathered erosional highs.
Example — BARTON ARCH, KANSAS

SOLUTION CAVITIES, or POROSITY DUE TO DOLOMITIZATION

Accumulations of this type are primarily stratigraphic.
Example — LIMA-INDIANA FIELD, OHIO and INDIANA

☑ AD No. 1
1. TRUNCATION
2. BURIED RIDGES
3. SOLUTION CAVITIES
☐ AD No. 2
4. OVERLAP
5. ORGANIC REEF
6. FACIES CHANGE

. . Recommends the Following General Approach to the Search for Stratigraphic Traps.

1. Consolidate all geologic information with particular reference to changes in lithology in the prospect area.
2. Obtain all available velocity information.
3. Make detailed velocity tests in all prospect wells, placing special emphasis on the determination of *interval velocities.*
4. Make full use of the opportunities presented by the continuous profiling method to assemble mass seismograph data, placing special emphasis on interval times—(TRACE ANALYSIS).
5. Separate time differentials caused by structural deformation or tilting, from differentials attributable to changes in lithology—(MAKE RESIDUAL MAPS).
6. Extrapolate from geologic control using imaginative geophysics.

A series of two advertisements showing 6 well-known stratigraphic accumulations.

Seismograph Service Corporation

TULSA, OKLAHOMA, U. S. A.

TOURING MIDDLE EAST.—Dahl M. Duff, right, international editor of The Oil and Gas Journal, is now in the Middle East on an inspection tour of producing and refining operations. He is shown above with Norman Hardy, vice president in charge of operations at Dhahran for Arabian American Oil Co. The accompanying article is Duff's first report on conditions in this vital area.

MIDDLE EAST

Aramco Goes All-Out

Increased demand on company's facilities, brought about by Iranian situation, taxing field installations to capacity

Dahl M. Duff

DHAHRAN, Saudi Arabia.—Arabian American Oil Co. currently is engaged in an all-out production effort which is taxing its field facilities to the top limit of their capacity.

The restriction is not on account of a lack of oil in the ground. There appears to be plenty of that. But the company can produce and deliver only as much as its wells, separators, stabilizers, and pipe lines will handle.

Construction of even the simpler field facilities here in the arid desert 10,000 miles from the United States involves a host of secondary problems. Materials, even when readily available, must be ordered 6 months to a year in advance. Manpower is a constant problem, and before it can be expanded, living quarters, water, subsistence, and all the other items must be provided.

Cause of this extraordinary demand on Aramco's facilities is, obviously, Iran. The company's contribution in the industry-wide effort to make up the Iranian loss is estimated by the end of 1951 to be upwards of 100,000 bbl. daily.

There is no disposition within the company to make capital out of the difficulties of the British, and the present policy is to meet the additional demand in the existing programs. This means there is to be no buildup to cope with a situation that, it is hoped, will be temporary.

Current output.—Aramco's current production averages about 840,000 bbl. daily. Early this year—before Iran—the company's program called for facilities to produce up to 800,000 bbl. daily with another 100,000 bbl. daily barely possible under emergency conditions. Producing and oil-handling operations are now taking place under these conditions.

By the end of the year, top Aramco capacity is expected to be above 900,000 bbl. daily. Over and above normal programed expansion, considerable work has been done in removing bottlenecks at various points in the system.

It is no secret that Aramco would be in a much better position today had it not been for the cutbacks that were made 2 years ago. The general slump in the industry was, in Aramco's case, aggravated and prolonged by the dollar shortage and currency restrictions in the areas in which its oil is marketed. Projects deferred at that time are just now being carried out.

Drilling program.—Aramco's drilling program is geared to the oil-handling facilities, and the wells completed in general keep slightly ahead of ability to treat and move the crude. At present, eight rigs are in operation, six in the Ain Dar-Uthmaniyah area, and two in the new offshore field, Safaniya.

Two new rigs have been purchased. One, already received, is being unitized, and the second is due to be in the field in January. Next year's program calls for the use of 9 or 10 rigs, most of which will be used in Uthmaniyah and Ain Dar.

One land well has been completed on the Safaniya structure since the discovery offshore from a platform early last summer. The land rig is to be moved to the Ain Dar-Uthmaniyah area, and further work continued with the "Queen Mary" diesel-electric drilling barge which Aramco bought from Creole Petroleum Corp. in Venezuela for $750,000. The Safaniya discovery gave Aramco its first sweet crude and its first proved commercial production from the Bahrein sand; plans for construction facilities are still in the future.

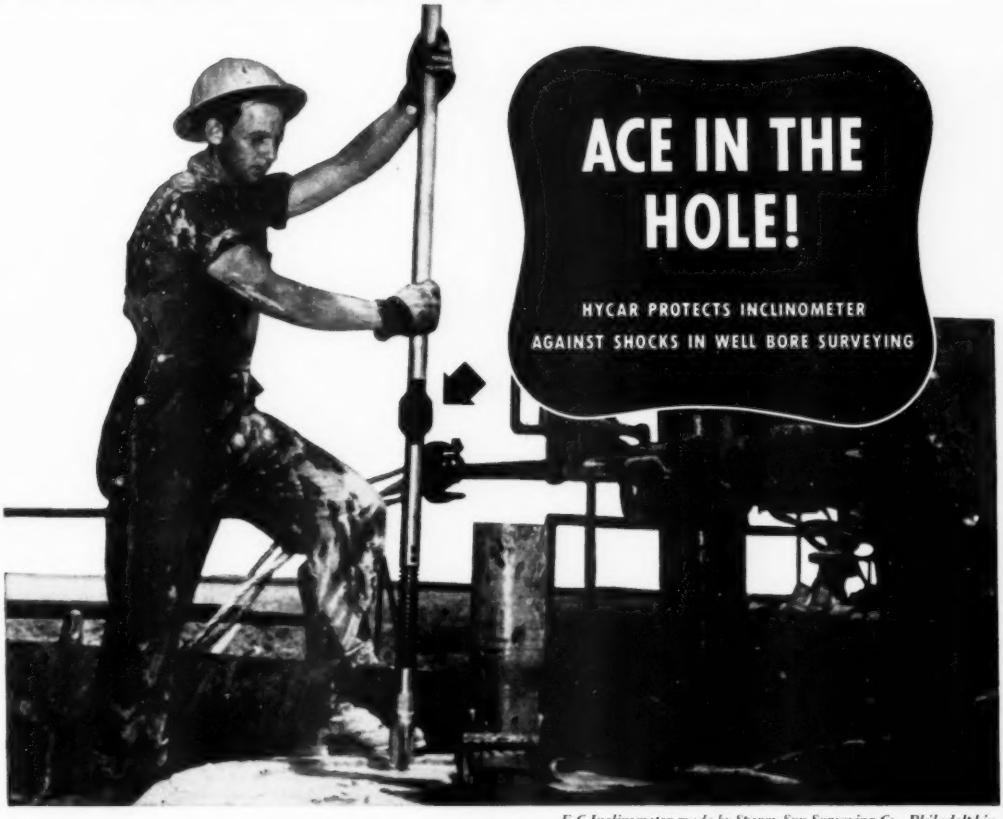
No leeway.—In operating at its present level, the company has virtually no leeway at any point from well head to shipping point. What storage that is available in the field is largely in the form of working tanks. Present plans call for the erection next year of ten 180,000-bbl. tanks, 6 for crude at Abqaiq and 4 for crude and products at Ras Tanura. Under present conditions, a power failure or a bad line break would in all probability mean permanently lost production until repairs were made.

Difficulty obtaining materials and slow deliveries have retarded some Aramco projects. For example, the second and third separator plants in Ain Dar have been delayed from 3 to 5 months primarily because of materials troubles. Meantime, the separator station now in operation is running nearly 50 per cent above its 100,000 bbl. daily nominal capacity.

Abqaiq main source.—Abqaiq continues as the company's main crude source with a peak production rate of some 580,000 bbl. daily. Abqaiq, however, will be cut back as new facilities at Ain Dar and Uthmaniyah are completed, progressively from October 1951, through 1952. By the end of 1951 the company will be able to take about 330,000 bbl. daily from

Another new development using

B. F. Goodrich Chemical Company ***raw materials***



E-C Inclinometer made by Sperry-Sun Surveying Co., Philadelphia. Hycar fin-guides made by Murray Rubber Co., Houston.

WHEN the Inclinometer pictured is dropped into the drill pipe to measure the "straightness" of the hole, it makes a punishing trip. Besides passing through the abrasive drilling fluid at terrific speed, it must also pass hundreds of pipe joints—take thousands of shocks.

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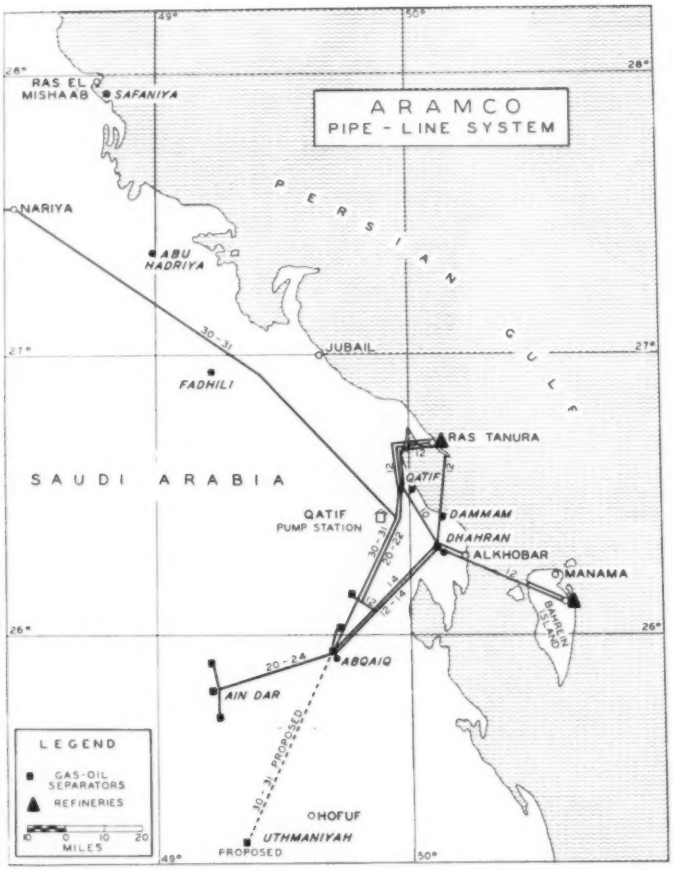

ARAMCO PIPE LINE.—This map shows the extent of Arabian American Oil Co.'s pipe-line system in Saudi Arabia, and location of separators and refinery sites.

Ain Dar. Later, a 50-mile, 30 and 31-in. pipe line will be laid to bring Uthmaniyah and the south extension of Ain Dar on commercial production. At present, the 580,000 bbl. daily from Abqaiq is being supplemented by 150,000 bbl. daily from Ain Dar, 20,000 bbl. daily from Qatif, and 90,000 bbl. daily from Dammam.

New facilities.—The increase in Aramco's total oil-handling capacity from the present 840,000 bbl. daily to 940,000 bbl. daily by year's end is being accomplished principally by the construction of two additional gas-oil separator plants at Ain Dar, two separator plants at Qatif, and an auxiliary pump station at Qatif Junction. At the latter point, crude received from the stabilizer at Abqaiq through a 30 and 31-in. line is discharged both northwest to Qaisumah to be picked up by the Tapline system and east to Ras Tanura through a 20-22-in. line and a newly completed 12-in. loop.

The new station, which will use field pumps temporarily, will provide sufficient additional pressure boost to enable the line from Abqaiq to handle up to about 410,000 bbl. daily. The station is due for completion in November. Most of the additional crude will go to Ras Tanura since capacity of the Aramco line from Qatif to Qaisumah and the Tapline system from Qaisumah to Sidon is unchanged at from 315,000 to 320,000 bbl. daily.

Automatic station.—An innovation with Aramco will be a completely automatic booster-pump station which is planned for construction on the 30 and 31-in. line between Nariya and Qaisumah stations. The station will operate unattended and will include a number of automatic shutoff features which throw the flow back through the main line.

Of the 1,068-mile Trans-Arabian system, Aramco owns and operates 315 miles to the Qaisumah station as a part of its gathering facilities. Qaisumah is a metering and royalty-gaging point where the crude is picked up by Tapline itself. The projected station between Nariya and Qaisumah is on the Aramco section.

The new station will allow greater flexibility to Aramco's Tapline deliveries since it will provide about 12,000 bbl. daily additional capacity and permit Aramco to make slight fluctuations in its movements to Qaisumah. The station will be built at Wariah during the first quarter of next year. Original construction plans of the Trans-Arabian system contemplated using thicker-walled pipe immediately downstream of each pump station. Thinner-walled pipe was, however, used out of Nariya due to pipe-delivery difficulties. The new station will offset this weaker point in the system.

Advantageous.—The unattended feature of the station is particularly advantageous to Aramco in view of the high cost of maintaining personnel in Saudi Arabia. It will be equipped with 400-hp. diesels driving Byron Jackson pumps. Auxiliaries include a 45-kw., 440-volt generator, 20,000-bbl. diesel storage, water and gasoline storage. Automatically operated, air-starting, 20-in. block valves on the suction and discharge sides divert the flow through the main-line bypass in case of trouble. Switches to operate this "fail safe" system work off pump-bearing temperature, pump-case temperature, jacket-water temperature, lubricating-oil pressure, and temperature, and the lubricating-oil reservoir. A suction-pressure switch also operates to prevent the pump from cavitating.

System complicated.—Aramco's own pipe-line system is complicated by the necessity of handling both stabilized and unstabilized crude. Unstabilized crude can be supplied only to the two refineries directly, the Bahrein and Ras Tanura plants which together take nearly 300,000 bbl. daily from the company. Ras Tanura throughput is about 175,000 bbl. daily. The line to Bahrein, looped except for its submerged section, handles about 125,000 bbl. daily. The Bahrein refinery also uses its own 30,000 bbl. daily production plus about 20,000 bbl. daily average moved by tanker from Ras Tanura.

The Abqaiq stabilizer is now undergoing alterations, including new pumps and additional oil-cooling capacity, which will raise its capacity to about 500,000 bbl. daily against about 450,000 bbl. daily at present. Besides Abqaiq, the company has 180,000 bbl. daily stabilizer capacity at Dhahran, and about 90,000 bbl. daily capacity at Ras Tanura.

These stabilizers are essentially weathering columns which reduce H_2S content of the crude from approximately 250 p.p.m. to about 10 p.p.m. Only stabilized crude is furnished to Tapline and for lifting by tanker at Ras Tanura.

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Mossadegh in New York

Iran's premier will appear before U.N. Security Council in opposition to any consideration of British complaint

Ted A. Armstrong

ARMED with a 20-page statement of Iran's views of the country's now-dead petroleum industry, Premier Mohammed Mossadegh arrived in New York this week to appear before the Security Council of the United Nations.

Mossadegh was prepared to oppose the council's expected consideration of Britain's complaint that Iran should be required to follow the recommendations of the International Court of Justice. These were that matters be kept in a status quo pending further attempts at arbitration.

The Iranian premier planned to tell the Security Council Iran is willing to employ technicians of Anglo-Iranian Oil Co., Ltd., on their old terms, to give preference in oil sales to traditional customers at prevailing prices, and to compensate Anglo-Iranian for its properties.

He also was expected to walk out of the council if it should decide that the confiscation of the British properties was a proper matter for it to debate. Further attempts at a reconciliation between the British and Iranians are expected during the 3-week visit of the Iranian premier. President Truman has invited Mossadegh to visit him, and the Iranian premier has accepted.

Officials accompanying Mossadegh said the premier would welcome any further mediation efforts by the United States which took into consideration Iran's position under the law nationalizing the petroleum industry.

Mossadegh claimed Britain's earlier complaint before the International Court of Justice was illegal and said the British Government intervened in the nationalization proceedings only because Anglo-Iranian is an instrument of British imperialism.

The United States State Department apparently was dedicated to a continuing attempt to achieve a reopening of negotiations between the Iranians and British.

In view of the strongly worded charges and counter charges, the matter was not being pressed, but it was obvious that efforts were being made to obtain an agreement that a new attempt at negotiations would be made. It was also considered probable that the Security Council would request both countries to send representatives again to confer on the problem.

There also was a rumor in London that the oil company, 53 per cent owned by the British Government, soon will change its name to British Petroleum Co., eliminating any reference to Iran.

Iranian attitude. — There was no change in the Iranian view toward expropriation of the oil fields and refinery. In another appearance before the majlis Premier Mossadegh again declared the oil question to be a domestic affair only.

Huessin Fatemi, his assistant, reiterated the assertion that the United Nations Security Council has no jurisdiction over the matter and said that if it should decide to deal with the issues Premier Mossadegh would simply reject the British complaint and refuse to discuss the merits of the case if, over Iranian objections, the issues were debated.

British gone. — At the end of last week all British officials and employes of Anglo-Iranian Oil Co., Ltd., had left Iran.

The first contingent in the "economic Dunkerque" left on a British air liner October 3, followed by the evacuation of about 300 more by the Cruiser Mauritius. The next day the last group, headed by Alec Mason, chief Anglo-Iranian representative, and B. B. Ross, refinery manager, drove from their residences in Khorramshahr, near Abadan, to Basra, Iraq.

Their departure was hailed in Teheran as a national victory. Newspaper editorials enthusiastically called it the end of "50 years of British imperialism and plundering."

In London the evacuation became a major political issue in the forthcoming October 25 election, with Conservative Leader Winston Churchill attacking the Labor Government for its weakness and the Laborites countering that to have remained would have meant war with Iran.

Company attitude.—In London Anglo-Iranian officials indicated that the Iranian operation has been dropped at least temporarily.

Basil R. Jackson, deputy chairman of A.I.O.C., was quoted as saying: "We are definitely out of Iran now and we are not counting on her for anything. We are looking ahead and not backward and we can work up a very profitable business so long as our interests in the Middle East remain intact."

There was a feeling among oil men, however, that the Abadan refinery would not remain completely idle, that if no solution were found in international negotiations the Iranians would be able to operate it at a fraction of its capacity and turn out basic products.

AUSTRALIA

A.I.O.C. May Build Plant

Representatives of Anglo-Iranian Oil Co., Ltd., are now in Australia to study the prospects of establishing a new refinery of considerable size.

While reports from Australia said the company is planning to build a refinery with a capacity of 50,000 to 70,000 bbl. per day, Anglo-Iranian officials described the report as "premature."

Before plans for the refinery materialize several questions must be answered. One is whether the Abadan refinery eventually may be returned to the company. Another is whether the Australian Government will participate in the new plant and assist in financing it, and whether, if the government does not wish to participate, it will permit Anglo-Iranian to build the refinery on its own.

Anglo-Iranian now operates in Australia as Commonwealth Oil Refineries (Australia), Ltd., jointly owned with the Australian Government. The company has an old 2,500-bbl. refinery at Laverton, near Melbourne, which has for some time been almost altogether a topping operation.

Total refining capacity in Australia at present is about 15,000 bbl. per day. Australian Shell Oil Co. now has under construction a 22,000-bbl. refinery at Geelong, near Melbourne, which is scheduled for completion in 1953.

EUROPE

Austrian Production Up

Reliable estimates of crude-oil production in Austria, one of the Iron Curtain countries, indicate that output there will show an increase of about 18 per cent during 1951.

Production during 1950 averaged about 34,000 bbl. per day, but information on current activity suggests that this will be stepped up to average about 40,000 bbl. daily this year.

The increased production is largely from new fields at Bockfliess and Anderlaa, in Lower Austria. Together they produce about 30 per cent of Austria's oil.

Besides these new areas, the country's production comes from the old Zistersdorf area, which produces about 30 per cent of the country's total, and from the Matzen area, which for some time has been the leading field with about 40 per cent of the total Austrian production.

Current reports say the Soviet-directed oil industry at present is engaged in a stepped-up exploration program, with the search concentrated mainly in Burgenland, near the Hungarian border. *(International news continued on page 188.)*

PERSONALS

Sunkel Promoted

Atlantic official given new production assignment

LAURENCE A. SUNKEL, general manager of Atlantic Refining Co.'s domestic crude-oil-production department, Dallas, has assumed the duties of Edward H. Blum in regard to production in the United States and Canada.

Blum has retired as vice president and general manager of crude-oil production after 46 years' service with Atlantic.

A native of Paris, Ill., Sunkel attended Trinity University, Waxahachie, Tex., and did special work at Southern Methodist University in Dallas. After service in World War I, he joined Atlantic's purchasing and accounting department.

In working his way up he became accountant, and later chief of that department, a position he held for 12 years.

Following the East Texas field boom in the mid 30's, Sunkel was named assistant to Blum, a position he held until 1946 when he was named manager of domestic production.

Sunkel, who recently was elected a director and member of the executive committee of the Texas Mid-Continent Oil and Gas Association, has been a member of the general committee of the American Petroleum Institute division of production, and of the production vocational-training committee.

W. C. Hewitt, process consultant for Phillips Chemical Co., has been appointed superintendent of operations, and **L. H. Dowell,** chief accountant in the chemical-manufacturing section of the controller's department, has been assigned as staff assistant to the vice president and general manager. Both will remain in Bartlesville, Okla.

Bert L. Wangener, petroleum engineer for Skelly Oil Co. at Bay City, Tex., has been transferred to Hobbs, N. M., as drilling engineer.

Henry E. Feed, Jr., has joined Amerada Petroleum Corp. at Billings, Mont., as geologist. He was formerly assistant computer for Century Geophysical Corp. at Lexington, Neb.

Harry C. Carr, chairman of the board of the First National Bank of Philadelphia, has been elected to the board of directors of Atlantic Refining Co., replacing **E. H. Blum,** who has retired.

M. L. Cobb, superintendent of the lubricating-oil division in Continental Oil Co.'s Ponca City, Okla., refinery, has been promoted to the newly created position of director of training for the firm's manufacturing department. He has been with Continental since 1925.

Charlton H. Lyons, independent operator, has been named chairman of the recently created Western Hemisphere oil study committee of the Independent Petroleum Association of America.

William Thiebaud, tool pusher for Humble Oil & Refining Co., has been transferred from Winters to Avoca, Tex., and promoted to assistant district superintendent.

W. K. Bonillas, formerly instructor in petroleum engineering at University of Texas, has accepted a position with Magnolia Petroleum Co. at Dallas in the research and development department.

Larry E. O'Brian, of Long Beach, Calif., has joined Phillips Petroleum Co. He recently graduated from the Colorado School of Mines with a geological engineering degree.

Max C. Eastman, formerly in charge of oil-field operations for the Navy at Elk Hills, Calif., will head the field operations for Reserve Oil & Gas Co. as vice president with headquarters at Bakersfield, Calif. He has been with the Navy department for 12 years.

John H. Osborne, petroleum engineer in the Casper, Wyo., office of the United States Geological Survey, has been transferred to Thermopolis, Wyo., to assist district engineer **J. H. Hassheider** in activities throughout the northwestern Wyoming district.

Raymond I. Potter, chief of the fuels and lubricants division of Standard Oil Co. (Ohio), has been elected chairman of the Cleveland section of the Society of Automotive Engineers.

Autrey L. Sikes, formerly district superintendent for Anco Gas Corp. at Gainesville, Tex., has joined Sklar Oil Corp. at Longview, Tex., as general production superintendent.

D. A. JORDAN

Dewey A. Jordan, district and general superintendent for Atlantic Refining Co. for 17 years, has joined **Edwin B. Cox** and **Edwin L. Cox,** oil producers at Dallas, as superintendent of production. Jordan is a past president of the Petroleum Engineer's Club and is vice president of the Southwest technical advisory committee on vocational training for the American Petroleum Institute.

J. H. Miracle, formerly secretary of United Gas Corp. at Shreveport, has been elected a vice president, and **B. H. Winham,** assistant to the president, was elected secretary.

William D. Davis has been named head of the geological department of Stanford Oil Co. Davis, who will operate from the firm's field office at Evansville, Ind., was geologist for Standard Oil Co. of Ohio for many years.

E. D. Loughney has been named general manager of Canadian Gulf Oil Co., succeeding **John H. Bevel.**

Seaton T. Preston, formerly with California Research Corp., has accepted a position as assistant professor of petroleum engineering at University of Texas, and as research engineer for the Texas Petroleum Research Committee.

Leland E. Wilson, petroleum engineer for Atlantic Refining Co., has been transferred from De Ridder, La., to Longview, Tex.

Bernard Goulston, formerly assistant manager of Imperial Oil, Ltd's technical-service division, has been appointed chief staff chemist of the research department at Sarnia, Ont., Canada. He joined the firm in 1923 as a chemist at the Montreal East refinery, and 3 years later went to Talara, Peru, as chief chemist with International Petroleum Co. He returned to Canada in 1927 and was

PERSONALS

made chief chemist at Imperial's Ioco refinery in British Columbia. He was transferred to Sarnia refinery in 1936, and appointed assistant manager of technical service in 1948. **C. C. Bimel** has been appointed manager of the crude-oil purchasing division of the supply department at Edmonton. He joined Imperial in 1934.

E. L. Wells, party chief for Continental Oil Co., has been transferred from Torrington, Wyo., to Greeley, Colo.

W. F. Sutton has purchased **F. H. Armstrong's** interest in Armstrong & Sutton Drilling Co., of San Antonio, and will operate under the name of Sutton Drilling Co.

Glen R. Schimmel and **Marshall W. Taylor** have organized Schimmel-Taylor Co., a new drilling firm in San Antonio. Schimmel was formerly an independent operator, and Taylor was associated with Kirkwood & Morgan, Inc.

R. M. Golden, geologist, has joined the staff of **C. A. Lynch** at Evansville, Ind. He was formerly with Coy Oil Co.

ROGER GILBERT

Roger Gilbert, vice president of Atlas Corp. for the past 12 years, has been named president of Panhandle Producing & Refining Co., to take office next January 1. He will replace **John V. Boyce** who is retiring as president and a director at the end of this year. Gilbert, a member of the Atlas Corp. organization since 1931, has been a director and chairman of the executive committee of Panhandle since the spring of 1947.

E. B. Jones, chief gager for Arkansas Pipeline Co. at Longview, Tex., has been named superintendent of the Haynesville, Tex., area, succeeding **C. O. Rhodes** who has retired after 31 years.

William R. King, Jr., geologist with the Federal Power Commission at Kansas City, has resigned and joined Ashland Oil & Refining Co. at Henderson, Ky., as geologist.

J. Raymond Eiffe, formerly general superintendent of Esso Standard Oil Co.'s Bayway refinery, Linden, N. J., has returned east to become assistant general manager of the East Coast manufacturing operations after a year's assignment as assistant to the manager of the Baton Rouge refinery.

CARL G. HOLT

Carl G. Holt, formerly petroleum engineer for The California Co. in the North Louisiana area, has joined Wheless Drilling Co. at Shreveport as drilling and production engineer. **A. F. Adcock** has joined the firm at Paradis, La., as tool pusher.

George R. Belt, party chief for Gulf Research & Development Co. at Littlefield, Tex., has been transferred to Fort Worth and promoted to geophysicist.

E. A. Davenport, Illinois division production superintendent for Shell Oil Co. since 1949, has been appointed production manager of the division. He joined the firm in 1933, became Kansas division exploitation engineer in 1945, and was transferred to Illinois in 1947 as assistant district superintendent.

Edwin P. Davis has resigned his position as geologist with Atlantic Refining Co. at San Antonio to take a similar position with Houston Oil Co. of Texas in that city.

Emmette Shieck has resigned from Morton Oil Co. at Casper, Wyo., and has set up offices there as a consulting geologist.

Ghalib Alani, who recently graduated as the first student from Iraq to receive a B.S. degree in petroleum engineering, is continuing graduate study at the University of Texas as holder of the Shell Oil Co. fellowship.

Murrell D. Thomas, geologist with Eason Oil Co. since 1947, has resigned to become a consultant with offices at Oklahoma City.

Dr. A. Lewis, Jr., has been appointed chief product engineer in the new motor-lubricants and additives section added to Gulf Oil Corp.'s product-development department. He is on transfer from the Gulf Fellowship at Mellon Institute where he has been an assistant to **Dr. W. A. Gruse. Robert L. Grun,** on transfer from Industrial Products Engineering where he served as chief fuels and lubricants engineer of the process oil section, has been appointed chief product engineer in the newly added industrial and specialties section. **R. L. Nix** succeeds Grun as chief fuels and lubricants engineer in the process oil section. Nix was formerly with the chemical division of Gulf Research & Development Co. **H. H. Donaldson** has been transferred to the product engineering section as chief fuels and lubricants engineer, and **R. P. Gilmartin** succeeds Donaldson as chief fuels and lubricants engineer of the equipment section.

Paul W. Wright has been promoted to assistant superintendent at the Charleston, S. C., refinery of Esso Standard Oil Co., Inc. He was formerly technical assistant to the superintendent for 2 years after serving as chemical engineer at the Baltimore refinery.

Craig Smith has been promoted to superintendent in charge of all operations in the Rocky Mountain area for Lohmann-Johnson Drilling Co. His headquarters will be in Denver.

DR. G. ZULOAGA

Dr. Guillermo Zuloaga, a member of the management committee of Creole Petroleum Corp., has been elected a director of the company. He fills a vacancy created by the resignation of **Willard M. Hall,** who has retired. Zuloaga joined Creole in 1939 as assistant manager of the geological department. He became manager of the department in 1945 and was appointed to the management committee in 1948.

C. M. Lydy, process engineer for Socony-Vacuum Oil Co., Inc., at East Chicago, Ind., has joined General Petroleum Corp. at Vernon, Calif., as an assistant job engineer in the engineering department.

E. F. Bullard, president of Stanolind Oil & Gas Co., was named a trustee of the Midwest Research Institute at seventeenth annual meeting of the trustees in Kansas City.

T. C. Daws, division engineer for Continental Oil Co. at Ponca City, Okla., has been transferred to Wichita and promoted to division superintendent.

Glenn Purcell, a veteran of 22 years with Shell Oil Co., has been promoted to superintendent of Shell Chemical Corp.'s plant at Deer Park, near Houston, succeeding **Frank E. Cady,** who has been transferred to the firm's Martinez, Calif., plant as manager. **Frank G. Watson,** formerly an operating department manager, moves up to assistant superintendent, and **Robert K. Walker** becomes chief engineer of the plant.

PERSONALS

Charles M. Rutter has been appointed corrosion engineer in the distribution department of Equitable Gas Co., Pittsburgh. He will be in charge of all corrosion activities within the department.

R. W. McOmie, manager of Shell Oil Co.'s Wilmington, Calif., refinery, will spend the next several months on a special assignment in the firm's manufacturing department at New York. **S. J. Meisenburg,** Wilmington superintendent, will act for McOmie during this period.

Robert C. Morrison has been promoted to supervisor in the operations-analysis department at the Bayonne, N. J., refinery of Esso Standard Oil Co., Inc.

W. D. Ohle has been appointed general traffic manager for Sinclair Refining Co. He joined the firm in 1919, was named assistant to the vice president and general traffic manager in 1933, and traffic manager in 1944.

A. A. Jergins, formerly associated with Jergins Oil Co. of Texas, has resigned to become an independent operator at San Antonio, Tex.

Louis R. Records, superintendent of operations for Sohio Petroleum Co. at Shreveport, has been transferred to Lafayette, La., in the same capacity. **James M. Gibson,** formerly assistant of operations of the Kansas district, has been named to succeed Records at Shreveport.

F. A. Menken has been named vice president in charge of exploration and appointed to the board of operations of Tide Water Associated Oil Co. **L. C. Decius,** formerly vice president, has resigned.

William G. Rogers, president of East Ohio Gas Co., has been elected a director of the parent firm, Consolidated Natural Gas Co. Rogers, who became president of East Ohio in March, previously was executive vice president. He has been with the firm since 1941.

Gaylord L. Campbell has resigned as geologist with British-American Oil Producing Co. to become Rocky Mountain district representative for Ginther, Warren & Ginther, oil producers.

D. N. Rockwood, of Union Producing Co., has been elected president of the New Orleans Geological Society. Other officers elected were: **John Collier,** Pure Oil Co., vice president; **Raymond B. Kelly, Jr.,** Richardson & Bass, secretary; **Martin Watson,** Schlumberger Well Surveying Corp., treasurer. **Gene Gaysinger,** The Texas Co., and **Gene Gibson,** Humble Oil & Refining Co., were elected directors for 3 years; **Carl Grubb,** Superior Oil Co., for 2 years; and **Orville Noland,** Humble, for 1 year.

L. E. Cranston has been named staff assistant to **E. L. Sinclair,** manager of Socony-Vacuum Oil Co., Inc.'s, Paulsboro, N. J., refinery.

Leo H. Moir, Jr., formerly district geologist for Wilshire Oil Co. in the coastal area, has joined Oceanic Oil Co. in a similar capacity with headquarters at Ventura, Calif.

Clarence S. Beesemyer, executive vice president of General Petroleum Co., has been named national vice chairman of the American Red Cross' 1952 fund-raising campaign.

L. B. Culligan, development geologist for The California Co. at Ardmore, Okla., has been transferred to Shreveport as exploration geologist.

D. A. Graham, superintendent of the grease and compounding department of Socony-Vacuum Oil Co., Inc.'s, Trenton, Mich., refinery has been transferred to the firm's headquarters at New York as manager of the operations division.

DEATHS

John Evon Nelson, 73, formerly a director and an executive vice president of Gulf Oil Corp., died October 6 at Pittsburgh. He was also a member of Gulf's executive committee; a member and secretary of its finance committee; a member and chairman of its annuity and service-award committee, and a member of various other policy-planning committees. In 1902 he became secretary to Andrew W. Mellon, one of the founders of Gulf, and later became secretary of the Treasury of the United States. He joined Gulf on June 1, 1908, and was elected executive vice president in 1941.

Frank Gaston Walling, 77, pioneer Tulsa oil man, died there October 6. In 1914 he helped organize Gilcrease Oil Co. and served as general counsel and vice president of the firm until his retirement in 1936.

Frank J. Tunstead, 64, former chief of the Flora, La., pump station of Interstate Oil Pipe Line Co., died September 26 at Natchitoches, La. He had been with the firm for 39 years prior to his retirement in 1950.

John Henry Alexander, 84, independent oil operator, died October 3 in Tulsa. He had been in the oil business for 70 years, beginning work in the oil fields of Pennsylvania at 14.

Steven F. Evelyn, 67, consulting engineer and former chief engineer with Worthington Pump Co., died September 27 in Westfield, Mass.

John R. Murrell, 70, Dallas oil operator, died October 8 in New York.

Joe Trees McMahon, Sr., 44, geologist associated with Benedum-Trees Oil Co., died October 1 at Shreveport.

Neville Y. Knox, 54, vice president of Shell Oil Co. of Canada, Ltd., died October 5 while on a trip into the interior of British Columbia. He had been with Shell 26 years and a vice president of the Canadian company since 1939.

John L. Eakin, 74, independent oil operator in Pennsylvania since early in this century, died October 4 at his home near Franklin, Pa.

R. H. Newton, retired head of production for Mene Grande Oil Co., was killed in a flood at Maracaibo, Venezuela, September 29. Newton drilled and brought in the first well at Humble, Tex., for the late Ross Sterling and associates.

Ben N. Youngken, 79, former vice president of National Supply Co., died October 1 in Los Angeles.

McGhee D. Gerard, 63, oil producer and distributor, died September 30 at Beverly Hills, Calif.

Henry T. Beckwith, retired geologist and mining engineer, died October 6 in Pasadena, Calif.

Lee Andrew Pauls, 75, retired engineer for General Petroleum Corp., died October 4 at Long Beach, Calif.

Christopher Eales, 55, construction division of Esso Standard Oil Co.'s Bayway refinery, Linden, N. J., died October 3.

John A. Jackson, 79, former president of Canfield Oil Co., which he served for 47 years, died September 30 at Cleveland.

Joe H. Romine, 55, independent oil operator, died in El Paso, Tex., October 4.

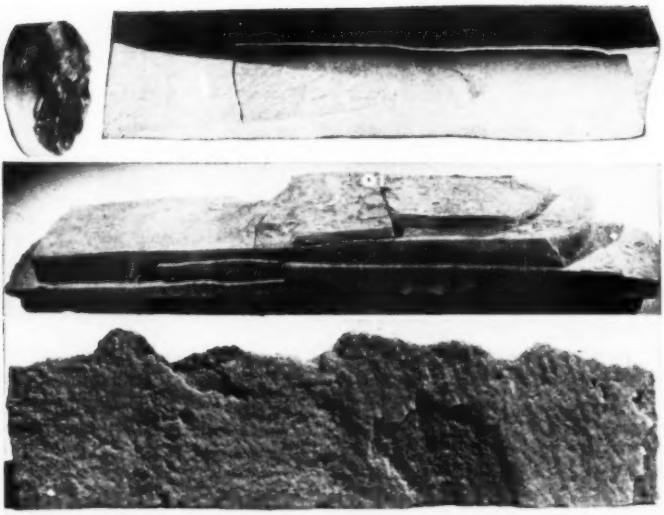


Fig. 1—Upper two photographs of cores illustrate the thoroughness of fracturing in Spraberry sandstones. Lower photograph shows the face of a fracture where a secondary deposit of calcite indicates that at least some time in the past the fractures were open sufficiently to permit deposition to take place. (Photographs courtesy Rotary Engineering Co., Inc., Midland, Tex.)

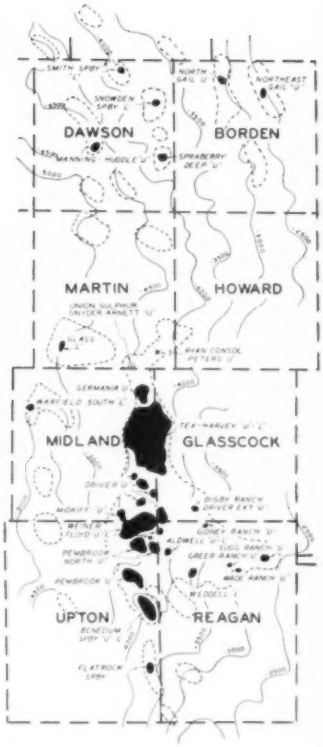


Fig. 2—Map showing present Spraberry production and, by dashed lines, those areas that are currently believed will be productive. (Map by J. R. Bartley, consulting geologist, Midland.)

Is World's Largest Oil Field Looming Up In West Texas?

Eventual production limits of the Spraberry trend are not now known, but it is believed the fields may ultimately grow to embrace over 2,000,000 acres, making the largest field in areal extent anywhere.

A FEW miles east and southeast of Midland, Tex., several oil fields are being developed that will probably join to form the world's largest single oil field in areal extent.

From Benedum field in eastern Upton and western Reagan counties northward to Tex Harvey and Germania pools of Midland and Glasscock counties, the Permian-Spraberry sand is producing oil from what appears to be one immense stratigraphic trap.

Present information indicates this producing area may ultimately be from 100 to 150 miles long and up to 40 miles wide and could be one oil field covering possibly 2,000,000 acres or more. These fields are shown on the accompanying map, and their distribution points to the possible extent of the Spraberry trend.

The producing Spraberry formation is Middle Permian (Leonard) in age and is a 1,000-ft. series of hard, tight, fractured sandstones, shales, and limestones which give up oil only by precise completion and production methods. The recovery of oil per acre from this zone will probably be low; however, the tremendous size of the area indicates a substantial addition to United States reserves.

Development History

The first oil was produced from Spraberry sands of West Texas when the discovery well of Spraberry field was completed in January 1949 in eastern Dawson County. In February 1949, the discovery well for Tex Harvey field in eastern Midland County was completed in the Spraberry sand, and this marked the first production from what some day may be considered the Greater Spraberry field.

In 1950 the Spraberry trend saw the discovery of six more fields, these being Pembrook, Germania, Benedum Spraberry, Midkiff, Manning-Huddle, and Smith Spraberry. Tex Harvey and the nearby Germania fields were developed rapidly on 40-acre spacing.

Accelerated development over the entire Spraberry trend has occurred during 1951. Many discoveries have resulted and 1,000,000 acres can be considered semiproven. On September 1, 1951, there were 422 producing oil wells with 232 rigs active in the several Spraberry fields. Both figures are gaining rapidly. The wells aver-

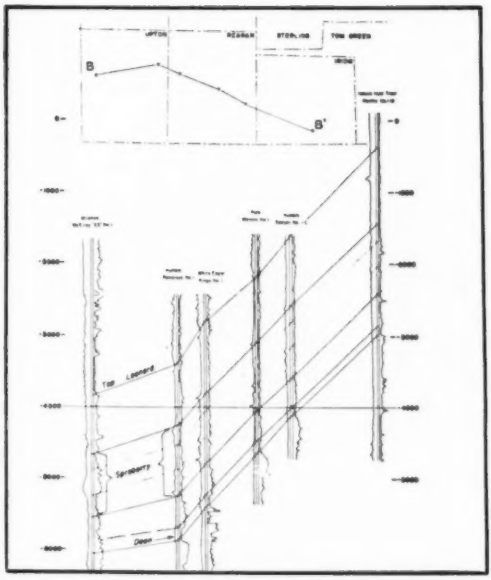


Fig. 3—East-west cross-section. Upton to Irion counties.

Cooperative Effort Is Sought

Because a critical steel shortage threatens development of the 1,000,000-acre-plus Spraberry trend of West Texas, interested operators met in Fort Worth on September 26 to discuss means of equitably continuing drilling operations that would not work excessive hardship upon any operator or royalty owner but would at the same time save steel and permit all operators to continue drilling operations.

The accompanying paper was prepared expressly for this meeting by cooperative effort of several interested operators to illustrate the expanse of the area involved and to show why the problem must be met quickly and solved fairly. If 40-acre development continues throughout the trend, some 4,590,000 tons of steel will be consumed in the wells and in allied installations. Nearly half of this could be saved by widening the spacing pattern to 80 acres.

age 7,500 ft. in depth and require approximately 45 days to drill.

Geology and Core Data

The Spraberry formation of Permian Leonard age consists of an average of about 1,000 ft. of hard tight sandstones, shales, and limestones. It is sometimes subdivided into an upper and lower sand separated by a shale and lime interval, all three units being about equal in thickness; however, in many places the lithology throughout the section suggests that the entire formation should be regarded as a single producing unit which contains more sand in its upper and lower measures.

In the northern portion of the producing belt the Spraberry is more sandy and more permeable than in the southern region. Core analysis of the sands in the northern part of the basin show permeability as high as 70 md. and porosity up to 25 per cent, while in the southern productive belt average permeability is less than 0.2 md. and the porosity only 8 to 10 per cent.

To bound the Spraberry on the west, north, and east, the typical facies of sand, shale, and lime changes abruptly to a predominantly carbonate section and is recognized only as Leonard. On the southeast and south the Spraberry sands and limes grade into black shale. Generalized north-south and east-west cross sections of the Midland Basin showing the position of the Spraberry section accompany this memorandum.

Vertical fractures. — In the south one-half of the area it is known that the Spraberry formation is vertically fractured with the sets of fractures roughly paralleling each other and being very closely spaced. In the northern portion of the Spraberry basin the fractures are less in evidence but are probably present. These fractures are important in making production of oil possible from the otherwise almost impermeable Spraberry sands.

SPRABERRY DRILLING AND COMPLETIONS BY FIELDS OR AREAS

(Midland, Upton, Reagan, and Glasscock Counties, Texas)

County—	Rigs	Locations	Completions
Tex Harvey	65	60	263
Germania	4	5	38
North Pembrook	25	14	16
Weddell	3	0	3
Wimberly	2	0	2
Pembrook	15	26	37
Benedum	11	8	15
Four Corners area*	103	42	88
Midkiff	9	3	17
Others†	5	2	6
Wildcats	16	21	
Total	258	182	486

*Because fields in this area where Upton, Reagan, Midland, and Glasscock counties merge, including the fields known as Driver, Weiner-Floyd, and Four Corners, are confused as to boundary and extent and because they are rapidly merging, they are here lumped together. †Includes Flat Rock Spraberry field and others new unnamed fields.

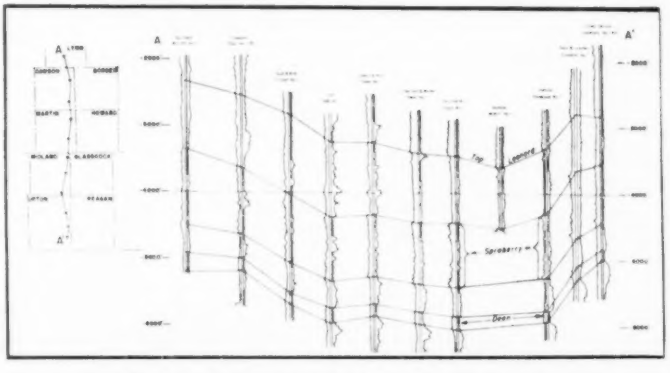


Fig. 4—North-south cross-section. Lynn to Upton counties.

The numerous fractures form underground channels through which the Spraberry oil may migrate over considerable distances into the nearest bore hole. The efficiency of the process is greatly increased where these fractures converge or cross each other. As oil is produced from these fractures they are doubtless recharged by a very slow migration of the oil through the slightly permeable sand due to pressure differential.

A lower Leonard sand section, the top of which is about 400 ft. below the base of the Spraberry, is also present over much of the area under discussion. This is the Dean sand, which averages about 200 ft. in thickness and is productive in High Lonesome field south of Midland. Present information suggests that oil production from the Dean may not be prolific, but some production can be expected from these deeper sands over at least a part of the Spraberry trend.

Future Development

The eventual production limits of the Spraberry trend are, of course, not known at this time. An attempt has been made to show on the accompanying map areas of proven, semiproven, and possible Spraberry production. Later development will undoubtedly require many changes in their outline. It is believed that 500,000 acres are proven, another 500,000 semiproven, and another 1,000,000 acres or more might possibly be productive. In other words, the fields may ultimately grow to embrace over 2,000,000 acres. By comparison, East Texas field covers only 133,000 acres.

Spraberry oil is being produced in the following counties: Upton, Reagan, Midland, Glasscock, Martin, Dawson, and Borden. Some Spraberry production may also be discovered in Howard, Lynn, Garza, and Terry counties.

Present information indicates that Spraberry production south of Martin County may be more of the blanket type, i.e., more continuous than that in the vicinity of Spraberry field where local structures may control accumulation to some extent.

Ultimate recovery.—There is wide speculation concerning the ultimate recovery of oil to be expected from the very tight sands and fractured shales that make up the reservoir. Many oil men think that the recovery will be as little as 2,000 bbl. per acre or less, while others use a figure of 3,000 bbl. or even as high as 4,000 bbl. per acre. A few operators mention figures as high as 10,000 bbl. per acre recovery, although it is believed present information does not warrant such enthusiasm.

The smaller estimates are based on the low porosities and permeabilities of the formation, some data on pressure-decline curves, and the probability that all of the oil will be produced from the reservoir solely by expansion of the gas that is in solution in the oil. Also, it should be noted that initial bottom-hole pressures are approximately 500 lb. below normal in the Spraberry sands.

If 1,000,000 acres are productive and the recovery is 2,000 bbl. per acre, a reserve of 2 billion barrels of oil is present. This is a significant addition to the national reserves. By using a larger area and a greater recovery per acre, it is possible to envisage a four or five billion barrel oil field.

Problems of Development

If 1,000,000 acres are productive, 25,000 wells will be required to develop the area on a 40-acre spacing pattern. Should, after complete development, these wells produce at a rate even as low as 40 bbl. (the allowable in many West Texas fields), there would be a million barrels per day of production from the Spraberry. This may be compared to the present Railroad Commission District 8 (West Texas) allowable of 1,030,000 bbl. from 29,500 wells. If the productive area is found to be 2,000,000 acres, the number of wells would be doubled and the problems of allowables and development would probably increase in a greater ratio.

Steel requirements.—It is estimated that 25,000 wells would require 4,590,000 tons of steel for casing, tubing, gathering lines, gasoline plants, pumping units, and tank batteries. This is two and one-half times the oilfield requirements of Texas in 1950 and seven times the annual normal needs of West Texas.

Assuming 4,000 wells will be drilled per year, it becomes apparent that about 40 per cent of the entire State of Texas allocation of steel would be used to develop the Spraberry, and this ratio would have to be maintained for several years for its complete development. This would cause a large cutback of drilling in the rest of West Texas as well as over the entire state.

Fig. 5—Highly fractured Spraberry core with diamond core head as size reference.

The West Texas pipe lines are at present filled to capacity although the latest Spraberry discoveries and extensions are not yet connected into the lines. The capacity of these lines would have to be duplicated in order to carry a million barrels per day of Spraberry oil which present spacing and drilling rates indicate may be producing within a few years.

Economics.—The average Spraberry well is about 7,500 ft. in depth and costs approximately $80,000 to complete. If 2,000 bbl. per acre recovery proves to be an accurate estimate, wells drilled on 40-acre spacing would produce 80,000 bbl. of oil over an estimated productive life of 7 years. This would result in a gross income of $204,000 per well at the present price of oil, $2.55 per barrel. It is estimated that a net of only $27,300 remains after deducting $80,000 drilling costs, royalty of $25,500, taxes of 19 cents per barrel or $15,200, and lifting costs of 70 cents per barrel or $56,000. The return is so low that the area may be considered marginal from the standpoint of capital invested as well as from the number of barrels of oil secured per ton of steel consumed.

Conclusions

The enormous and unprecedented size of the task of developing this multibillion barrel oil field on a 40-acre spacing pattern makes it advisable to consider the advantage of drilling the undeveloped portion of the area on an 80-acre pattern, particularly during a period of shortages. On this date less than 4 per cent of the 500,000-acre area now regarded as "proved" has been developed. It is recognized that some allowances would be proper and desirable where operators have, in good faith, already drilled on a 40-acre pattern.

The wider spacing would enable operators to bring twice as large an area into production in any given length of time and would thus more adequately protect the correlative rights of all royalty owners and operators. The saving in steel and other critical materials would be in the national interest.

The lack of pipe-line facilities to move any appreciable new oil from West Texas will have to be rectified before too many additional wells are drilled unless withdrawal from all West Texas is sharply curtailed in order to make room for the Spraberry oil. If eventual closer spacing is proved to be needed and the recovery per acre will justify it, it will, of course, be possible to add them at a more opportune time when materials are more plentiful.

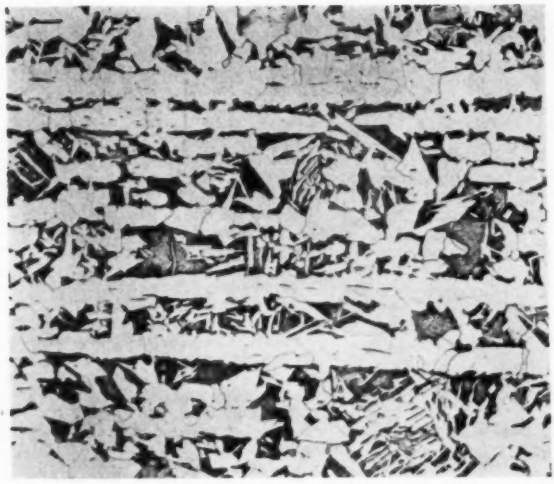


Fig. 1—Microstructure typical of hot rolled steel. Ferrite (iron) composes the light background with the darker areas made up of small dark particles and lamellae (cementite) in a light matrix (ferrite).

Fig. 2—Graphitization in a high-aluminum deoxidized plain carbon steel after 7,700 hours at 1,025° F. Light matrix is ferrite and dark masses are graphite. No cementite is present.

Here are some things you should know about

GRAPHITIZATION OF STEEL

by A. M. Hall* and H. M. Banta*

IN January 1943, a steam pipe line at the Springdale station of West Penn Power Co. suddenly broke near a welded joint. The line, made of carbon-molybdenum steel pipe, had been in operation for the previous 5½ years at an average temperature of 935° F. Fortunately, the boiler was going off the line when the break took place and pressure was falling rapidly, so no serious damage occurred. This sudden and unexpected failure touched off a whole series of investigations through the power industry and its suppliers.

What had happened to the pipe line, in operation so long, to cause this unforeseen failure? The steel had graphitized in a manner that produced an embrittled section in the pipe.

Soon after the investigations were under way, it was found that graphitization was occurring to a greater or lesser extent in the steam lines of numerous other power stations which were operating at steam temperatures in the same range as the Springdale station. In fact, in one midwestern station the phenomenon had proceeded almost to the extent found at Springdale, but the condition was discovered before actual failure occurred.

Now we find that the insidious phenomenon of graphitization has been doing its destructive work in another field, that of petroleum refining. In the past, the petroleum industry has fortunately not encountered operating conditions in refining equipment that were conducive to graphitization. The more recently developed catalytic cracker, however, utilizes conditions that closely approach the optimum for promoting the formation of graphite in steel. As a result of these conditions plus sufficient operating time, several serious cases of graphitization have appeared in the reactor vessels of cat-crackers. The object of this paper is to briefly explain the phenomenon of graphitization and to outline the available information which is applicable to the refining industry.

WHAT is graphitization? How does it damage steel? Under what circumstances does it take place? What can be done to prevent it?

The question, what is graphitization, may be answered as follows: Most unhardened structural and engineering steels are normally made up of two microstructural components. The principal component is ferrite, which may be considered, for the purpose of this discussion, as substantially pure iron—a soft, ductile metal of relatively low tensile strength. The second constituent is cementite, which is iron carbide, Fe_3C, a very hard, brittle compound. Steel derives its combination of strength and toughness from the mixture of these two constituents. The function of the carbon in steel is to provide it with cementite. A normal steel structure typical of pipe and tube steels, as seen with the microscope, is shown in Fig. 1.

Process of Graphitization

While steel is normally a mixture of ferrite and cementite, this mixture is thermodynamically unstable. Given the opportunity (i.e., prolonged exposure at elevated temperatures), the cementite will decompose into its elements, iron (ferrite) and carbon. The latter will take the form of graphite,

*Battelle Memorial Institute.

which is soft and weak. The steel will then be converted from the thermodynamically unstable mixture of ferrite and cementite to the thermodynamically stable mixture of ferrite and graphite. The process of this conversion is known as graphitization. The structure of a steel which has graphitized is shown in Fig. 2. Before graphitization, the structure of this steel, as revealed by the microscope, was similar to that shown in Fig. 1.

How does the conversion of cementite into iron and graphite, i.e., graphitization, damage steel? There are two principal types of graphitization. The first consists of the formation of graphite distributed uniformly throughout the steel. In this case, the cementite is replaced by the weaker constituent, graphite, which results in a reduction of the room-temperature mechanical strength of the steel. This loss in strength, however, does not affect elevated-temperature service where the phenomenon of creep is dominant in establishing the service performance.

The creep resistance of the steels we are discussing depends upon the characteristics of the ferrite, which are not changed in the graphite-formation process. Therefore, in many engineering applications, the general effect of graphitization may not be important.

The second type is the formation of graphite in local and highly concentrated regions. When this occurs, it can be expected to ultimately lead to mechanical failure, as long as the conditions permitting graphitization to take place continue to exist.

The most frequently encountered form of localized graphitization is that which occurs near a welded joint. Nodules of graphite tend to nucleate in a narrow zone which corresponds to the low-temperature edge of the region of the parent metal that was heated during the welding operation. This heat-affected zone is continuous and, in a typical pipe joint, goes all the way through the wall of the pipe, as well as all the way around it. The situation is shown schematically in Fig. 3. As graphitization proceeds, the nodules grow in size.

At the low-temperature edge of the weld-heat-affected zones, shown in Fig. 3, the number of nodules per unit volume is so great that it is possible for them ultimately to grow and link

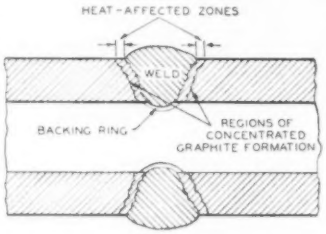


Fig. 3—Schematic longitudinal median section through a single-V butt-welded pipe joint.

together in a fairly continuous form. The result is illustrated by Fig. 4, which shows part of the heat-affected zone of a severely graphitized welded steam-pipe joint. Thus, by the process of localized graphitization, a narrow section extending around the pipe and through its wall is converted from strong steel to weak graphite. Since the graphite, which has replaced the steel, cannot take the loads designed for the steel, failure through the graphitized region is to be expected. This is the mechanism by which the Springdale failure occurred.

Another form of localized graphitization has also been observed. This type originates in planes of localized yielding in the steel, called Lüder's lines. These lines may be developed during cold forming of the steel, such as bending.

What are the circumstances of graphite formation in steel? The thermodynamics of the process are quite clear, but the mechanism whereby it takes place is not well understood. It appears, however, from what is known to date, that the graphitization process falls into the class of "nucleation and growth" processes. In order for the cementite to decompose into graphite nodules and iron, there must first be nuclei upon which the graphite can form and grow into nodules as cementite decomposition proceeds. As a first step in the proc-

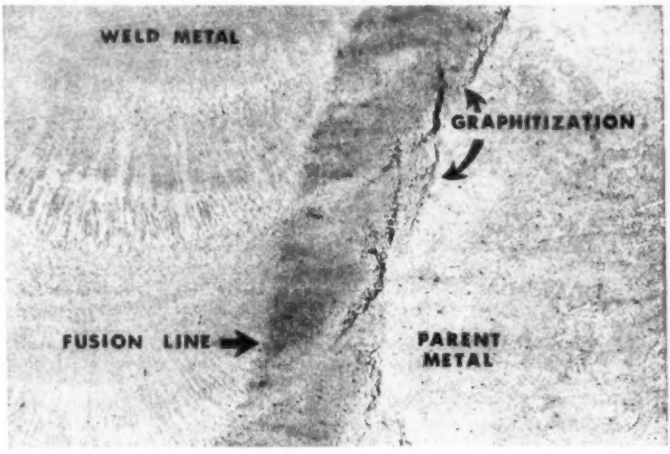


Fig. 4—Graphite formation at low-temperature edge of the heat-affected zone of a welded pipe joint.

READING FOR PROFIT
JOURNAL CHECK CHART

Have steel in service at 825° to 1,350° F.?

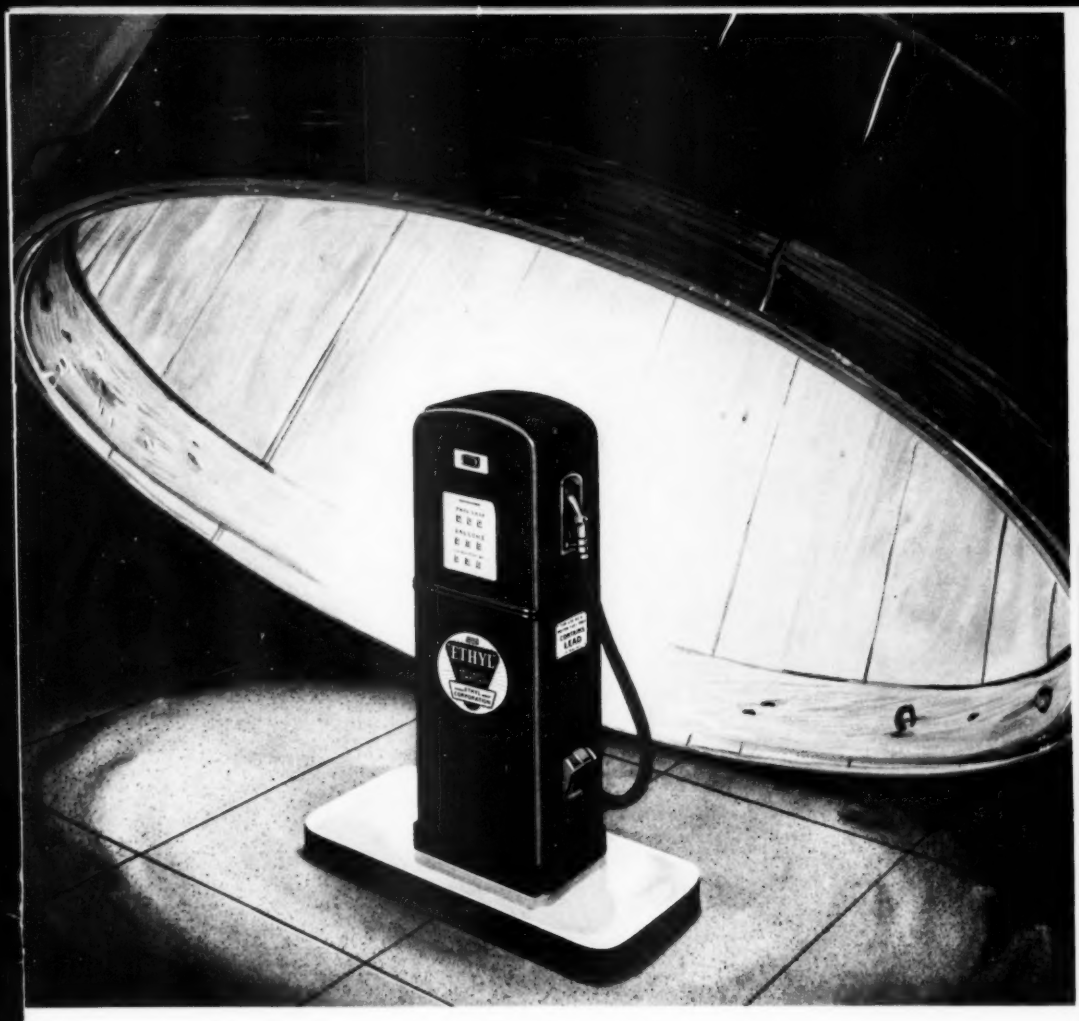
GRAPHITIZATION OF STEEL presents serious problems in high-temperature applications. Check your awareness of these problems and steps being taken to solve them.

☐ 1. Graphitization of steel, which is a chemical separation of carbon from iron carbide, may be expected to occur in the temperature range, 825° to 1,350° F. The maximum rate occurs at about 1,200° F.

☐ 2. The most frequently encountered form of graphitization is that which occurs near a welded joint; however, graphitization also occurs where bending during cold working has occurred.

☐ 3. Tendency of low-carbon steels toward graphitization may be reduced by either high temperature stress relieving or normalizing welds and bends. Graphitization tendency may be eliminated by including 1 to 3 per cent chromium and 1 per cent molybdenum in the steel.

☐ 4. No suitable nondestructive test method for graphitization has yet been developed.



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(continued on next page)

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We don't hide *your* light under a bushel

(*continued from preceding page*)

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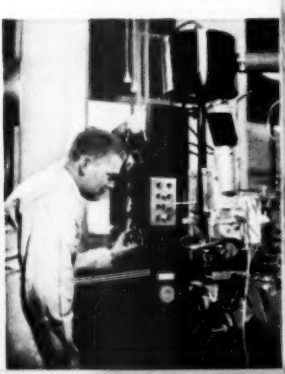


ess, then, graphite nuclei either must be present or must form.

Steels containing the necessary nuclei or in which the nuclei form very rapidly are considered to be graphitization susceptible. If considerable time is required, running to several thousand hours, for the development of graphite nuclei, the steel is classified as moderately resistant to graphitization. Those steels whose nucleation time is indefinitely long are considered, for practical purposes, to be completely resistant to graphitization.

Once graphitization has begun in a steel, it continues at about the same rate in all steels, whether their nucleation time is very short or very long. Curves like those shown in Fig. 5 can be drawn plotting the course of

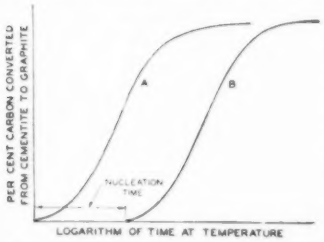


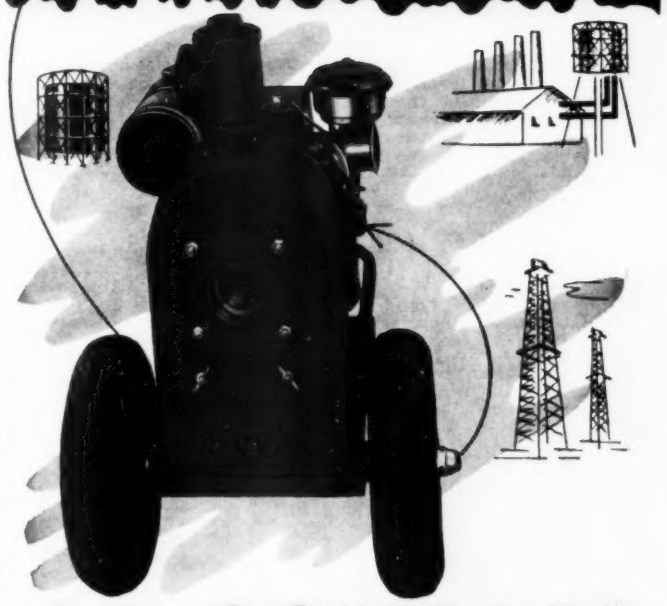
Fig. 5—Idealized reaction curves for the graphitization process. Curve A is for very susceptible steel and Curve B is for a moderately resistant steel.

the graphitization process as a function of time at temperature. As the curves indicate, the graphitization process generally starts rather slowly, then increases in rate, and finally tapers off in rate as it nears completion.

Like all other chemical reactions, the graphitization process is strongly influenced by temperature. Even in very susceptible steels, it takes place at extremely low rates at temperatures below 825° F. As temperature is raised above this point, the reaction occurs with increasing rapidity until a maximum is reached in the range of 1,150° to 1,200° F. Above this temperature, there is reason to believe that graphitization proceeds more and more slowly, and probably does not occur at all above 1,350° to 1,400° F. The effect of temperature may be illustrated from the following data: In laboratory tests, a graphitization-susceptible carbon-molybdenum steel had half of its cementite converted to iron and graphite in 9,000 hours at 925° F., but it required only 700 hours to produce the same amount of graphitization at 1,125° F.

Of even greater importance than service temperature is the difference in the inherent susceptibility to graphitization that is displayed by various types of steels. These differences have been found to depend on the composition of the steel and the steel-making practice. For example, plain-carbon and carbon-molybdenum steels deoxidized with relatively large

BEST for OIL FIELD JOBS



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amounts of aluminum (1½ lb. or more per ton) are susceptible to graphitization, while those deoxidized with small amounts of aluminum (½ lb. per ton or less) are quite resistant to graphite formation. Silicon-killed steels are also generally quite stable and are resistant to graphitization. Carbon-molybdenum steels seem to be slightly less susceptible to graphitization than are plain-carbon steels. Chromium, when added in amounts greater than ½ per cent, produces a steel highly resistant to graphitization. In fact, experience obtained thus far indicates that this element imparts immunity to graphitization, for all practical purposes.

What can be done to prevent graphitization? The obvious answer to this question appears to be the best answer at this time. Use steels which are not susceptible to graphitization. The trend in the power industry, especially since the demand is for ever higher steam temperatures, is to abandon the plain-carbon and carbon-molybdenum steels in favor of chromium-molybdenum steels. The chromium-molybdenum steels have thus far proved to be immune to graphitization, for all practical purposes.

The carbon-molybdenum steels may or may not be resistant to graphitization, depending on deoxidation practice. The industry is taking the position that it is a sounder policy to use chromium than to specify the deoxidation practice. For long service at 950° F. and above, it is advisable to take advantage of the increased oxidation resistance given the steel by the presence of chromium.

The chromium-containing steels currently being used in steamline applications below 1,000° F. include one containing 0.80-1.10 per cent Cr and 0.40-0.60 per cent Mo, covered by A.S.T.M. Specification A-315. Another one is Grade P 11 of A.S.T.M. Specification A-158 with 1.0-1.5 per cent Cr, 0.50-1.0 per cent Si, and 0.45 to 0.65 per cent Mo. For operating temperatures at 1,000° to 1,050° F., somewhat more chromium is favored. The two analyses used to date are 2¼ per cent Cr, 1 per cent Mo, and 3 per cent Cr, 1 per cent Mo. These are Grades T22 and T21, respectively, of A.S.T.M. Specification A-213.

A considerable amount of work, both in the laboratory and in the field, has been carried out in an effort to treat welded joints of susceptible steels in such a way that they won't develop graphitization localized in the weld-heat-affected zones. To this end, two types of postweld heat treatment have been worked out. One is a high-temperature stress-relieving treatment carried out in the range of 1,300° to 1,425° F. The other is a normalizing treatment, usually at 1,650° to 1,750° F. Data on the efficiency of such treatments are conflicting. However, it seems established that, by suitably post heating a welded joint in a graphitization-susceptible steel, the formation of graphite nodules localized in the parent metal adjacent to the weld can be retarded, but probably not prevented.

In the building of new equipment for use under conditions which could produce graphitization, the designer may readily solve the problem by the selection of the proper steel as discussed above. However, in the case of old equipment in which graphitization may be expected, the problem faced by the operator is not so simple.

No nondestructive testing procedure is now available for determining the occurrence of graphite in steel, nor is there any other type of test that may be used in the field. In order to detect graphitization and to determine the extent to which it has progressed, it is necessary to examine with the microscope samples taken from the equipment in question. Bend or tensile tests may also be required in some cases to help evaluate the situation.

In the inspection of equipment for graphitization, the samples should be selected from those locations where the thermal and stress conditions appear most severe. In welded structures, the heat-affected zones adjacent to the welds are the most likely locations for concentrated graphitization. Trepanned plugs or boat samples are normally taken from such locations for examination.

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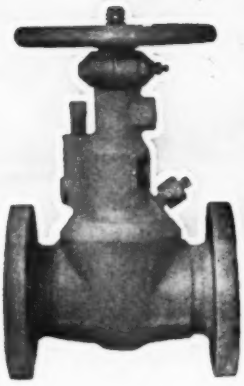

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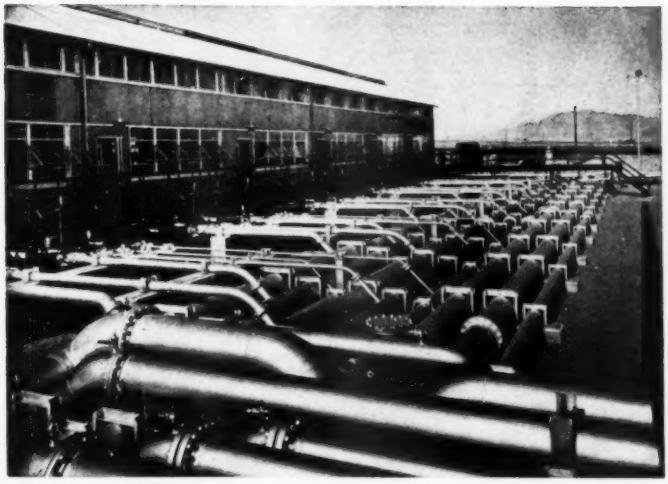


Flow pulsation often presents a serious problem in compressor stations such as the one shown here.

Richfield engineer explains reasons why his firm has become consistent users of

Pulsation Dampeners in Compressor Piping Systems

by M. L. Arnold*

THE possible ill effects of pulsative flow in compressor station piping may be summarized as follows:

1. Fatigue failure of piping and heat-exchanger tubes.
2. Erroneous measurement of gas streams entering and leaving the station.
3. Reduction in volumetric capacity of compressor cylinders.
4. Increase in horsepower requirement per unit volume of gas pumped.
5. Increased cost per brake-horsepower of installed capacity.

The list is formidable and warrants serious consideration of the phenomenon of pulsative flow, what it is, why it occurs in compressor-station piping, and what measures may be taken to eliminate it, or at least mitigate its ill effects. The phenomenon usually evidences itself by the vibrations it sets up in piping.

Experiences With Pulsating Flow

In 1941 we started our North Coles Levee gas-injection plant. This plant consisted of six 600-hp, 2-cycle, direct-connected, right-angle, gas-engine-driven compressors. Each unit had six power cylinder and three compressor cylinders. Gas was compressed from 400 to 3,400 psig. in two stages. Two compressor cylinders on each engine were used on the first stage, and one on the second stage. The plant had been, we thought, carefully engineered and designed, but when it was placed in operation very heavy vibrations developed in the double expansion U-bends, which had been used to absorb movements due to thermal expansion and contraction of the piping.

The seriousness of the situation resulted in a hasty, but fairly comprehensive investigation into the causes and effects of vibration, and means for controlling it. By applying some of the information acquired, we were able to reduce the amplitude of vibration to what were believed safe limits, largely through the installation of spring-type vibration dampeners on the piping. The findings made in this investigation were reported in a joint meeting of the California Natural Gasoline Association, and the Southern California Section of the American Society of Mechanical Engineers in December 1944.

Even though we were reasonably certain that the amplitude of the movements of the piping was being controlled within safe limits, we could not be certain that this was the case. We were, therefore, anxious to determine accurately the causes of the vibrations and eliminate them if possible.

In 1945 the engineering firm which had designed and constructed the plant informed us they had completed development of a device which they believed would eliminate our trouble, if the cause of the vibration were pulsative flow. However, neither they nor we knew whether the vibrations were the result of the pulsative flow of gas, or of mechanically transmitted forces originating from the reciprocating parts of the engines, or a combination of the two. Therefore, we decided to make a joint survey of the plant for the purpose of determining this.

Causes of Pulsative Flow

Before describing the methods employed in the survey, or describing the corrective measures proposed if the cause were found to be pulsative flow, a brief discussion of the phenomena occurring in the compressor piping will be outlined.

Gas does not flow from a compressor cylinder in a continuous steady stream. It emerges in what Murphy[1] has described as "puffs." The magnitude and duration of these puffs is a function of the cylinder size and clearance, and the compression ratio. The frequency of the puffs is a function of the compressor speed in revolutions per second, and is twice as great for a double-acting cylinder as for a single-acting cylinder.

When these puffs of gas are emitted into the discharge piping they compress the gas in the immediate vicinity of the compressor discharge valves and cause flow in the line away from the cylinder. The velocity of flow varies and is a function of the instantaneous rate at which the puffs are emitted, and the cross-sectional area of the pipe. This also originates a compression, or pressure wave which travels through the pipe at the velocity of sound in the gas. This pressure wave may be reflected and travel back along the pipe in a direction opposite to the gas flow.

The frequency at which the puffs are emitted is a function of the compressor speed in revolutions per second, and further depends upon whether the cylinder is operating single-acting or double-acting. If two or more cylinders use a common line, the frequency of the puffs is also a function of the crank angles between the various cylinders and the number of cylinders.

If two compressors are discharging into a header, the frequency of the puffs may or may not be the same

*Senior engineer, exploitation department, Richfield Oil Corp., Los Angeles.

as for one compressor. If both of the compressors are identical and the cranks are all in phase, then the frequency will be the same as for one compressor. If the cranks are 90° out of phase, the frequency will be doubled. If the cranks are alternately in phase, then out of phase, a variation in frequencies occurs which is known as a "beat frequency."

Obviously, the more compressors, the more possible frequencies exist. The puffs taken into the cylinder cause a rarefaction which creates similar disturbances in the suction line. In both cases the frequency of the pressure waves generated is the same as the frequency at which the puffs are emitted into, or withdrawn from the line or system.

It is evident from the foregoing discussion that two phenomena exist in the compressor piping. Both may be detrimental to good compressor operation. These are:

1. A pulsative flow of gas away from the cylinder in the discharge line and towards the cylinder in the suction line.

2. Pressure waves which may be traveling in both directions in both lines.

Investigation of Remedial Measures

In our case the immediate concern was with piping vibration. Regarding this Murphy[2] has stated that, ". . . serious vibration of the piping, if present, usually occurs at a relatively unsupported bend far from the compressor. Such a bend may behave as a Bourdon-tube pressure gage, and it must change the momentum of the gas. Its frequency as a mechanical vibrating system may change to coincide with the acoustical frequency and thus aggravate the difficulty." Essentially this states that the pulsative flow of gas, rather than pressure waves, is responsible for piping vibrations. We held the same opinion. Had we considered that pressure waves were responsible, we would have been less reluctant to accept the proposal which had been made to cure the vibrations.

Acoustical filters have long been used to suppress the pressure waves (sound) created by the air intake and the exhaust of gas engines. But to the best of our knowledge, such a filter had not been used to suppress the effects of pulsative flow. The filter proposed for this purpose consisted of two volume chambers connected by a length of tubing of smaller diameter. The gas was to flow through the three elements in series. It is shown diagrammatically in Fig. 1, and has been described by Stephens[3].

The relationship between the size of the volume chambers (V), the length (L), and radius (R), of the interconnecting tube, and the cutoff frequency (F) of the device is expressed by Stephens as follows:

$$L/R^2 \times V = C^2/78.67^2$$

in which,

- L = the length in inches of the passage in pipe.
- R = radius in inches of that passage.
- V = the volume in cubic inches of one of the equal volume chambers.
- C = net velocity as defined below, in feet per minute of sound in the gas, and of the gas stream in pipe.
- F = fundamental frequency per second of pulsations created in the gas line by the compressor and at the compressor outlet.

This and one other type of acoustical filter are discussed by Hirschorn,[4] who presents similar equations.

It was reasoned that a pinched valve in the compressor discharge line would be the rough equivalent of the L/R^2 term, and that the compressor surge bottle upstream of the valve, and the lateral downstream of the valve, would approximate the chambers (V) to a sufficient degree to allow us to determine whether our trouble was indeed caused by pulsative flow and could be corrected by the installation of the proposed device.

Before making the test, all mechanical vibration dampeners were removed from the piping and observations made of the acceleration and deflection of the piping at various points. A recording was made of the pulsations occurring in the discharge headers of both stages (Fig. 2).

Then the shutoff valves in the 3,400-psig. discharge lines were pinched sufficiently to create a 220-psig. pressure drop, and the corresponding valves in the 1,250-psig discharge lines throttled to create a drop of 120 psig. After throttling, it was found that the acceleration of the piping had been reduced to from 18 to 46 per cent of its original values, and that the displacements had been reduced to from 10 to 38 per cent. The results are given in Table 1.

TABLE 1

Station	Acceleration % of original	Displacement % of original
C	46	19
D	32	38
E	23	10
F	18	12

(Continued on page 141)

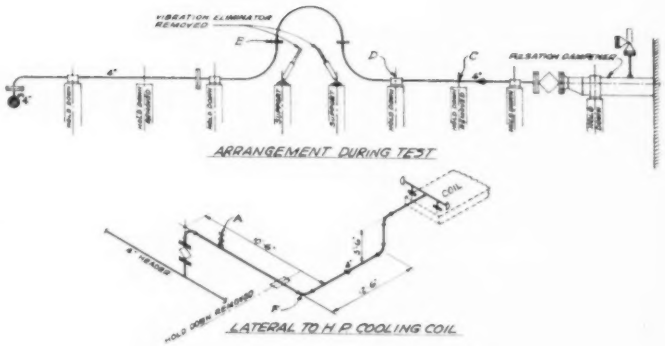


Fig. 2—Piping arrangement for pulsation tests.

Fig. 1—Volume chambers.

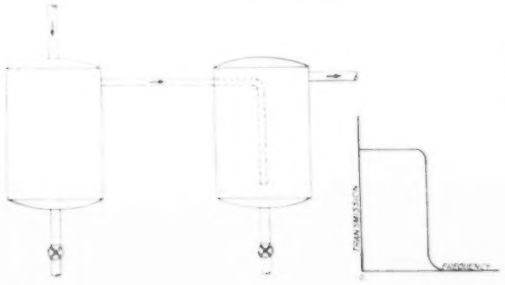
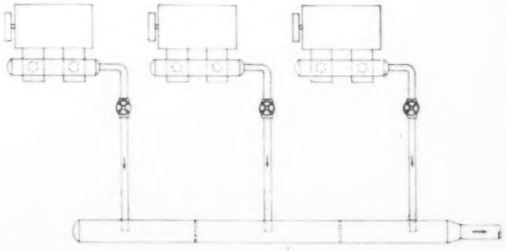


Fig. 3—Test-header layout.



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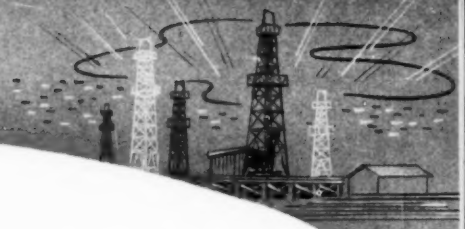

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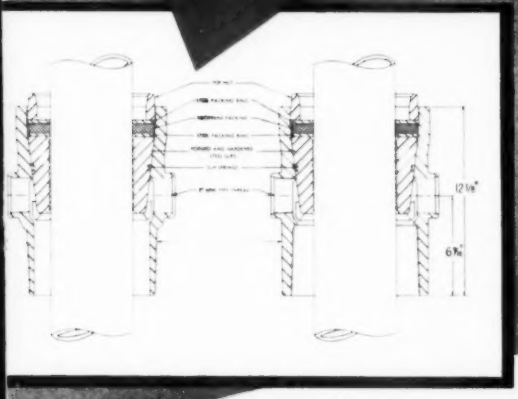

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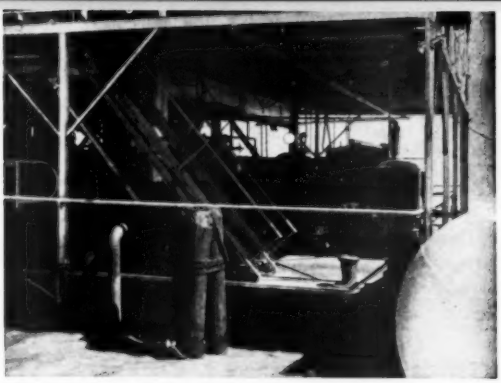
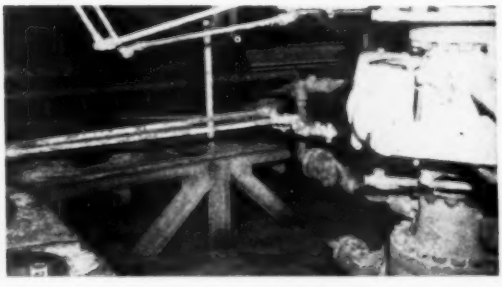
Phillips' split-pontoon drilling barge serving in development drilling in West Nueces Bay field of South Texas.



The barge is anchored with five pile-clusters. Butane, used as emergency fuel, is stored in the vessel shown in right foreground.



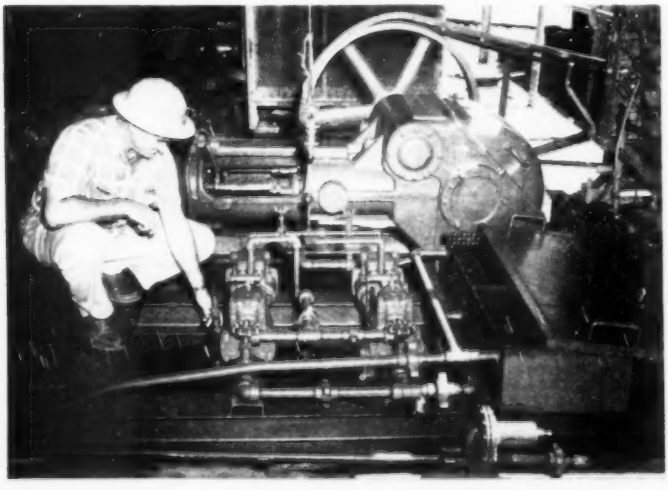
Barge sections are connected underneath the working area by six tie-trusses which are of all welded construction.

Split-Pontoon Drilling Barge

Phillips engineers devise barge built in two sections to pass through narrow drawbridge in West Nueces Bay

by F. Lawrence Resen
Gulf Coast District Editor

An unusual and effective method for lubricating pump piston rods has been devised by Jake Goldston, toolpusher on the barge rig. Two small pumps provide continuous supply of lubricant for all pumps on the rig.



PHILLIPS PETROLEUM CO. engineers were faced with an unusual drilling problem in South Texas' West Nueces Bay.

The problem: How to move a 40-50-ft. drilling barge through a drawbridge opening with a maximum clearance of 30 ft. and then across 6½ miles of water with a controlling depth of 2½-3 ft.?

The solution: Cut the barge in two! And Phillips engineers did just that, only in reverse. They designed a split-pontoon drilling barge, which was fabricated in New Orleans, moved past the drawbridge in two sections, and then tied together and rigged up in the bay proper.

Split-pontoon. — When the narrow width of the drawbridge made it impossible for Phillips to bring a conventional marine drilling barge into the bay, engineers hit upon the split-pontoon idea. Plans were prepared for a two-section drilling barge with each section measuring 10 ft. deep, 20 ft. wide, and 128 ft. long. The design called for the pontoons to be tied together, but at a distance of 10 ft. so that a slot would run length-

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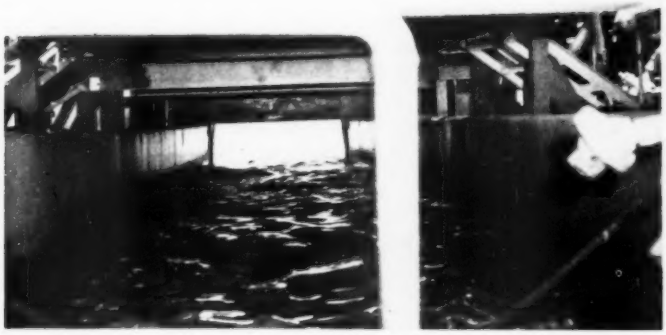


This view of the drilling slot shows two 24-in. beams which help tie together the two barge sections. Beams are bolted for easy removal.

Slogan on weight indicator emphasizes Phillips' safety program.

wise between the two pontoons. The over-all dimensions of the barge then became 10 by 50 by 128 ft.

Provisions were made in the design of the pontoons so that they can be joined and thereby be converted into a deck cargo barge if desired. The sections were fabricated by Calmes Engineering Co., New Orleans.

Outfitting.—The two barge sections were floated into West Nueces Bay and tied up to a Phillips landing. Drilling crews of the company did the necessary ship-fitting work to tie the two sections together and rigged up the 10,000-ft. power rig. Five days were required for tying the pontoon sections together and 2 weeks for rigging up.

The drilling platform was set up to straddle the two pontoons and the derrick load is thus distributed in the center of each pontoon. The draw works also straddles the pontoons, but is necessarily offset from the center of the pontoons by the width of the derrick.

At one end of the barge two pipe racks are installed with capacity for 12,000 ft. of pipe. A hinged catwalk connects the pipe racks with the drilling platform. The catwalk is raised when changing locations and lowered during actual drilling operations.

Six tie trusses connect the two barge sections underneath the working area. Forward in the drilling slot, two 24-in.-wide flange beams tie the sections together. These are bolted so they can be removed when the barge is backed off a christmas tree.

Reinforced Structure

In addition to the tie trusses and two wide flange beams, special derrick substructure reinforcing helps tie the two pontoon sections together. The four-post substructure is reinforced fore and aft. This was considered necessary in case the barge is raised or lowered unevenly. This action would set up stresses which could be dangerous. The forward substructure reinforcement is pin connected so that it can be removed while the barge is being backed off a christmas tree.

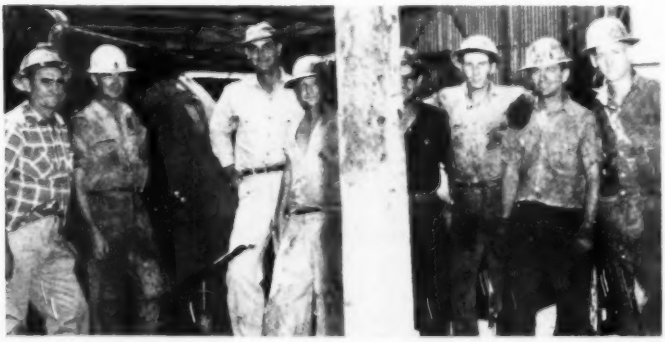
The two pontoon sections are reinforced by the use of structural bulkheads. These bulkheads have been built into the sections under each corner of the derrick substructure and also under the engine substructure. They provide extra strength to the pontoons, but are not provided for the purpose of watertight compartmentation.

Each pontoon is also divided into five compartments by watertight bulkheads. One of these compartments is used for mud storage and the others have seacocks to permit flooding. Mud pumps are used to pump out the pontoon sections when changing locations. A 6-in. manifold is laid on deck with risers into the pontoon sections for this purpose.

Tom Graham, design engineer in Phillips' Houston office, prepared the plans for the split-pontoon barge. Others who played an important part in the construction and rigging up of the barge include: H. W. Patterson, division drilling superintendent; Del Redding, assistant division drilling engineer, and Jake Goldston, tool pusher.

Field information. — West Nueces Bay field was discovered in September 1950 by Phillips Petroleum Co. 1 Frio, which produces oil through perforations at 8,370-80 ft. A later well drilled by Phillips, 3 Frio, opened a new oil sand at 8,592-98 ft. Recently Humble completed another new oil pay at 1 Fann D. Wilson, which flowed oil through perforations at 8,405-20 ft.

West Nueces Bay is located on the outskirts of Corpus Christi on a marshy delta near the mouth of the Nueces River and is practically landlocked. It is approximately 2 miles northeast of Saxet oil field and 1½ miles southwest of White Point gas field in extreme southern San Patricio County. The only entrance for shipping is the 30-ft.-wide drawbridge, which is part of the causeway at the mouth of the bay. The bay itself is very shallow and numerous pipe lines have been laid on its bottom. Mean water level is 2½-3 ft., and at low tide the bay is practically dry in spots.



Left to right: J. R. Goldston, toolpusher; E. B. Alleman, driller; Frank Davis, engineer, production department; J. B. Magers, motorman; H. J. Le Furgey, derrickman; R. J. Austin, W. H. Vessel, and R. C. Patchen, floormen.

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MUD PUMP VALVE
Scrapped plugs from mud pump valves (left) are rebuilt and hard-faced with Stoody 6. This alloy can be machined, and takes a high finish when surface ground. Hard-faced plugs far outwear ordinary plugs.

NEEDLE VALVE
Seating surfaces of top needle valve were cut out in ordinary refinery service. Rebuilt with Stoody 6 and machined (below), the faces are completely restored. Stoody 6 successfully protects many types of valves because of high resistance to heat, corrosion, impact and abrasion.

CUTTING KNIVES
The business ends of a drill pipe cutter were restored to better-than-new usefulness by (below) undercutting worn point, (center) building point oversize with Stoody 6, (top) regrinding to sharp cutting edge. Edges hold hardness even when operating at red heat!

CENTRALIZER SPRINGS
Three small spot-deposits of Stoody 6 take the brunt of frictional wear and heat on these steel centralizing springs. Forming and heat-treating are done after hard-facing. Weld deposits of Stoody 6 stay put during these operations.

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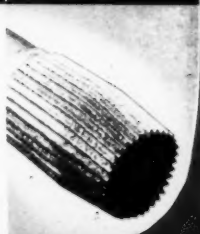

STOODY 6

Technique of Cost Estimating

. . . for oil refineries

Here the detailed cost estimate of a refinery project is considered from the standpoints of (1) what constitutes reasonable accuracy, (2) what information should be available in order to make an intelligent estimate, (3) techniques used in preparing actual estimate.

by Robert P. Wilson*

BECAUSE a detailed cost estimate itself costs money, the first factor to be determined is whether its expense is warranted. This may be accomplished by reference to the cost construction of similar existing units. Cost per unit of capacity can be obtained from personal records or data compiled by others.[1] The information thus available must be corrected to date by the use of a cost index.

If the proposed construction varies in size from those on which costs are available, it will also be necessary to ratio the costs up or down, for cost per unit of capacity varies with size. This variation in cost per unit of capacity with size is generally not a direct ratio, but rather an exponential function. If the costs of two or more similar units are known and corrected to the same base period, this exponent may be determined.[2]

Should only one set of data be available, then recourse to the "six-tenths factor"[3] is justified. A brief example may be in order at this point.

Approximate Costs

Let us assume the problem of estimating the approximate cost of an 800-bbl. per day alkylation unit as of December 1950. Available data for existing units are as follows:

Case 1.—A 1,700-bbl. per day alkylation plant was constructed in 1946 at a total cost of $1,258,000.

Case 2.—A 3,400-bbl. per day alkylation plant was constructed in 1949 at a total cost of $2,209,657.

The Nelson Refinery-Construction Index[4] for the periods under consideration are:

1946	100.0
1949	139.7
1950 Dec.	153.4

Total cost corrected to December 1950 thus is:

Case 1.—For the 1,700-bbl. per day unit, $1,258,000.00 × 153.4/100 = $1,929,772.00.

Case 2.—The 3,400-bbl. per day unit, $2,209,657.00 × 153.4/139.7 = $2,426,352.07.

Exponent R may be calculated from the relationship:

$$\left(\frac{\text{(Size of the larger unit)}}{\text{(Size of the smaller unit)}}\right)^{R} = \frac{\text{Corrected total cost of larger unit}}{\text{Corrected total cost of smaller unit}}$$

Example:

$$(3{,}400/1{,}700)^{R} = \frac{\$2{,}426{,}352.07}{\$1{,}929{,}772.00}$$

$$(2)^{R} = 1.257$$

$$R = 0.330$$

From this same equation, the cost of the 800-bbl. per day unit is calculated thus:

$$(3{,}400/800)^{0.330} = \frac{\$2{,}426{,}352.07}{\text{Total cost of 800-bbl. per day unit}}$$

Solving for cost of 800-bbl. per day unit gives $1,505,181.18.

An estimate such as this cannot be expected to be very accurate. However, some rough approximation such as this must be made, either mentally or on paper, to determine whether or not the proposition looks attractive enough, from the standpoint of investment return, to proceed with a more time-consuming and more accurate study known as the detail cost estimate.

Detailed Cost Estimate

Assuming it has been decided to proceed with the detail estimate, it is desirable to obtain the following information: (1) A flow diagram and plot plan of the proposed installation. (2) A materials-specification list. (3) A statement or advance knowledge of the construction characteristics. (4) A survey of available utilities. These items merit some individual consideration.

Flow diagram and plot plan.—The first step in construction of a refinery unit must be by development of process flow. The flow diagram contains information pertaining to the sequence of flow of all materials involved in the process, together with their characteristics, i.e., state—liquid, vapor or mixed phase; quantity; viscosity; gravity; temperature; pressure; etc. It also gives the required size of towers, reflux drums, settling drums, pipe lines, heat exchangers, furnaces, and other similar data.

From the flow diagram the process control arrangement is developed—the instrumentation. A list of the control valves, orifice settings, control transmitters and receivers, pressure gages, temperature indicators, and recorders of all types may be prepared and the flow diagram revised to show this instrumentation schematically.

With this information, the mechanical-design department can supply data concerning vessel thicknesses and weights, foundation and structural designs, pump specifications, driver specifications, utility requirements, and the plot plan or location and arrangement of this unit with respect to others and of the items of equipment contained in the unit under consideration with respect to each other.

Material specification list.—This information is generally supplied by the mechanical-design department and consists of standards for insulation material, pipe, valves, gaskets, flanges, steel, concrete, and methods of construction.

Construction characteristics.—In a refinery, as in few other places, a considerable emphasis must be placed on this item. Equipment in operation at the time of other construction frequently must continue to function, placing limitations on welding, movement of equipment, connection of piping, excavation, and similar work. The availability of materials and equipment is rather important, for delay of construction due to lack of material is often expensive.

Utilities survey.—The estimator must know what utilities are available in the vicinity, for if designed consumption exceeds availability, then additional water, gas, steam, electricity, air, etc., must be provided as a part of the construction cost for if they are not, the unit cannot function and the investment cannot be retired.

Armed with this additional information, the estimator can attack the problem intelligently. It is general practice to attain the total estimated cost by estimating the individual components as accurately as possible

*Process engineering department, Mid-Continent Petroleum Corp., West Tulsa refinery, Tulsa. Presented at A.S.M.E. Petroleum Mechanical Engineering Conference, Tulsa, September 1951.

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and to add to the sum of these costs a contingency figure which will be discussed later.

These steps in preparing a cost estimate will minimize omissions and other errors: (1) obtain flow diagrams, plot plans, utility surveys, and the specifications of materials to be employed; (2) break job down into comprehensible items; (3) estimate costs of individual items; (4) prepare a revised estimate, if consideration is long delayed. Finally, to improve technique, compare final job costs with originally estimated costs.

Components of Estimate

Main equipment.—Pumps and drivers, accumulator drums, towers and trays, heat exchangers—the main process equipment—are generally purchased prefabricated. Therefore, their costs are most accurately determined by the submission of requirements or sketches to various manufacturers or fabricators for bids. If prices are quoted f.o.b., freight and unloading charges should be added to the bid price. Should time not be available for this procedure, reference to actual costs of similar equipment can be brought up to size and date in a manner similar to that used for approximating the cost of the entire unit.

If the shells of the towers and drums are to be fabricated by plant facilities, the cost of material is determined on a weight basis—so much per pound. Labor costs are also a function of total weight with additions to labor costs made for the number and size of connections for piping and platforms.

Foundations and structures.—Concrete foundations are generally estimated on a cost per cubic yard basis. The cost to include excavation, forming, fabrication and installation of reinforcing, pouring, finishing, removal of forms and cleanup. The cost per cubic yard increases with the complexity of the job from the simplest nonreinforced slab floor to complex, reinforced octagonal footings for self-supporting towers. A more accurate method is to estimate the cost of the individual operations outlined above and to arrive at the total cost by summation of the component costs.

Erected costs of steel structures are estimated on a per pound basis—so much for material, shop fabrication, field erection, and welding. Grating and floor plate costs are generally on a per square-foot basis.

Erection of equipment.—This cost for towers and drums may be estimated as a percentage of material costs but such a procedure may yield results of questionable accuracy. A knowledge of available power equipment and other facilities together with first or second-hand information regarding the number of man-hours required for the job will produce a cost figure of greater probable accuracy.

The erection of overhead piping and the insulation of structures or equipment will require the use of scaffolding. If sectional tubing or similar types of scaffolding are available, only the cost of putting it together and movement to location need be considered, but if lumber types must be used, the cost of material or material loss must be included.

Pipe, valves and fittings.—Reference to the flow diagram, plot plan, and material specifications is made to determine the number and type of valves and the amount and size of pipe required. Generally the major portion of this item is the cost of valves. Particular attention must be paid to specifications, for the cost of a 4-in. valve may be anywhere from $50 to $1,000. The cost is dependent upon the type, size, trim, material, and series or service rating for temperature and pressure. Once these features are tied down and the number required of each size determined, there costs may be obtained from published catalogs and current discounts applied, or prices may be obtained directly from the local distributor.

Sufficient accuracy may be obtained by determining the cost of major valves, (2 in. and larger) and adding a single sum to cover smaller valves, keeping in mind that there may be hundreds of ½, ¾, 1 and 1½-in. valves required for bleeders, orifice settings, manifolds, pressure-gage connections, and the like.

Pipe required and the sizes of piping can be estimated from the flow diagrams and plot plan. Process, instrument, startup, and utility systems must be covered. The cost for each size and weight is obtained on a per foot basis.

The number, size, and type of fittings and flanges must be determined and the costs obtained from catalogs or manufacturers' representatives just as valve costs.

Labor for the fabrication of piping and the installation may be estimated as a percentage of pipe and small-valve costs plus an amount per major valve and fitting of each size. The percentage for labor costs is not taken on the entire material cost, for as was pointed out, valve costs are widely variant and essentially it takes the same labor to install each size valve regardless of its cost. The cost of pipe labor may exceed the cost of piping material on a job where small size lines and/or complex manifolds are a large part of the job.

Insulation.—The material specification lists are again consulted to obtain information about the types and thicknesses of this item for vessels and piping. Labor and material costs are then estimated on a per square-foot basis for vessels and large size lines. For lines 12 in. and smaller, a lineal-foot basis for each size and thickness may be used.

Buildings.—Costs for this item are generally based on the type of construction to be used and the number of floors. The cost determined as an amount per square foot multiplied by the floor area and by a factor for the number of floors. In general, the total cost for the same floor space is less as the number of floors increases and as the external dimensions approach a square.

Electrical work.—Much of this equipment used in refineries is vaporproof or explosionproof. The cost of such types of electrical equipment may exceed normal types of several hundred per cent. Therefore, specifications must be carefully surveyed. Individual items—motors, lights, starting equipment, conduit, etc., may be priced from distributors or catalogs. Labor is best estimated on a man-hour basis in view of the variation in equipment costs.

Painting.—This is generally done to protect equipment and facilities. Specifications should be consulted again to ascertain the number and types of coats to be applied. Material requirements and labor units are then determined on the basis of the surface to be covered and the number of coats required. Man-hours of labor and coverage per gallon vary with the method of application. Structures and vessels exposed to the weather may be sprayed while interiors of buildings probably require brush application, involving a greater labor factor.

Engineering and drafting.—The cost of preparing the construction drawings and material lists and the survey work for the job may be estimated as a percentage of the total cost—generally in the neighborhood of 5 per cent. As usual a more accurate figure is obtained by estimating the manhours of labor involved and multiplying by the average hourly wage.

Miscellaneous.—The estimate must include all items necessary for the operation of the unit. This includes such things as office furnishings, laboratory facilities, charges of foreign material (catalyst, acid, solvent, etc.) to the unit, fully paid-up or part-paid royalties, and waste-disposal facilties, if required, to mention only a few.

On a large estimate, it would be needlessly expensive to price each and every item involved. The intention is to provide an estimate of reasonable accuracy at a reasonable expense, not to attain the greatest

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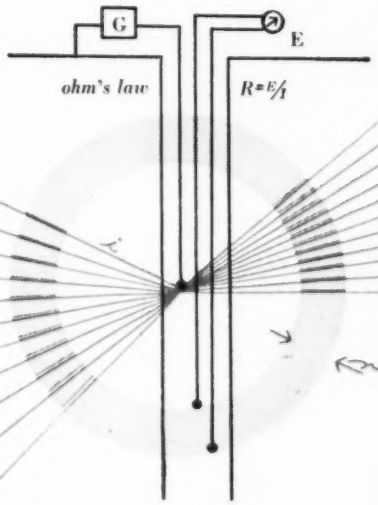

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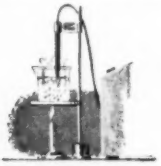

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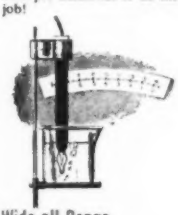

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possible accuracy. Therefore, minor items which would not materially effect the result are usually "lumped" as miscellaneous. Management will usually regard 5 to 10 per cent as sufficiently accurate. With experience, care, and adequate information 2 to 3 per cent accuracy can be attained.

Overhead.—In addition to direct labor charges to the job, a percentage of the total plant labor charge to the job is added to cover such items as holiday pay, sick time, workmen's-compensation insurance, social-security payments, group-insurance plans, etc. This overhead cost will naturally vary from plant to plant and should be obtained from the accounting department. In lieu of any information, a good figure would be 15 per cent.

Contingencies.—Over and above all estimated costs this item should be added to cover such unpredictable factors. As a rule, the amount of this item may be taken as a percentage of the total estimated cost less the cost of items to be purchased on fixed price contracts. The accuracy with which the estimate has been made, the stability of the current wage, price and labor situations, govern the percentage to use—normally 10 per cent may be satisfactory.

Presentation of completed estimate.—The final step of the detail cost estimate is to assemble the calculations for summation. It is advisable, at this point, to recheck the work for obvious omissions. For example, if an item of material appears as paint, then an item for painters' labor should appear. Very generally speaking, the total labor cost will be equal to the total material cost (prefabricated items of material excluded). If a wide variation is noted, then the situation should be verified.

Delays in approval.—Should the final estimate be disapproved and at some later date, due to market changes, be reconsidered, then the estimate itself should be reviewed in the light of new costs. Quite possibly construction indexes may be used to bring the entire estimated cost up to date. In any event, most of the work will have been done and it should be a relatively simple matter to prepare a new estimate for submission. In times, such as these of rapid inflation, this is important because the same factors which operate to make the payout appear more attractive may, at the same time, influence construction costs to bring the payout right back where it started.

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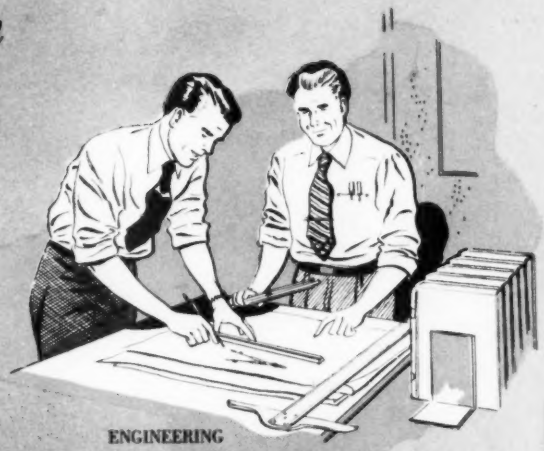

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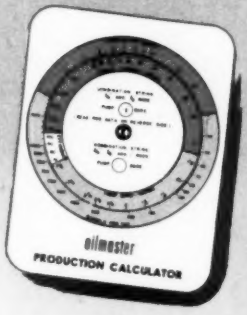

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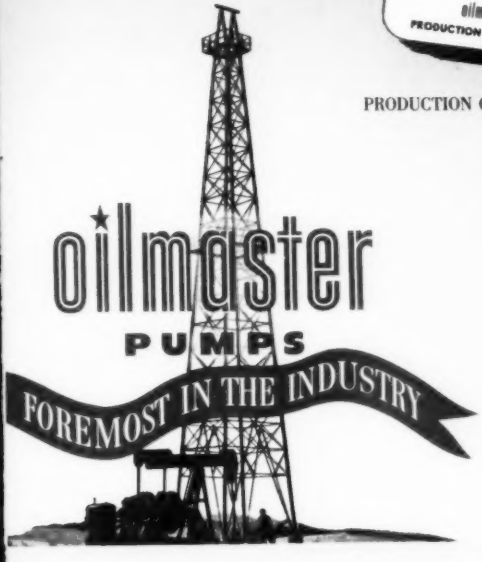

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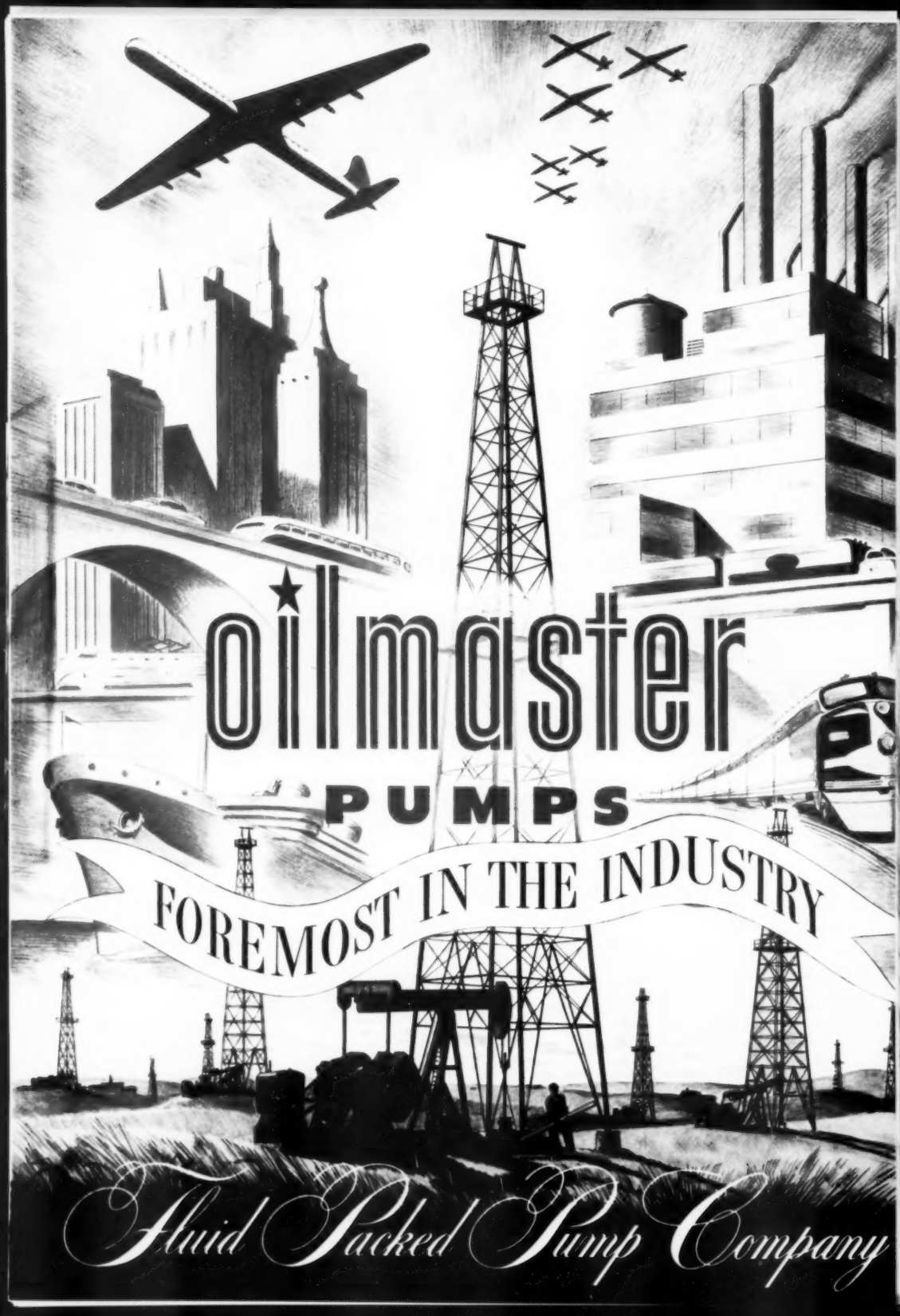
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New Technical Advances Unfolded At A.I.M.E. Oklahoma City Meeting

Walter Rose, new Journal district editor at Houston, here gives a first-hand account of many subjects; delivers own technical paper

A Reservoir Analyzer Study of the Woodbine Basin

R. C. RUMBLE, H. H. SPAIN, and H. E. STAMM, Humble Oil & Refining Co.

IN the words of the authors "the Woodbine basin is the only producing formation about which sufficient data have been compiled to permit a quantitative study of an entire aquifer." Accordingly, the paper presents a reservoir-analyzer study of the performance of the Woodbine formation in the East Texas basin utilizing a compilation of available information on the configuration, thickness, and the pressure drawdown of the formation. One of the special objectives of this study was to evaluate the influence of production from the various Woodbine fields on the pressure history of East Texas field.

The paper describes in a straightforward manner how the Woodbine basin is represented electrically on the pool unit of the reservoir analyzer. Maps are also presented illustrating the pressure drawdown of the Woodbine basin (contoured at 50 psi. intervals) in 1930 prior to the discovery of East Texas field, and in 1950. Diagrams of the pressure and production history of East Texas field are given, together with predictions of future performance as derived from the reservoir-analyzer study.

The authors were able to draw several interesting and important conclusions from their work. For example, they suggest that the compressibility of the sand should be considered with the compressibility of the Woodbine water to explain the rather high compressibility constant indicated by the reservoir-analyzer study. Further, they derive from the analyzer data apparent permeability figures of 1,000 to 1,500 md. in vicinity of the East Texas field, decreasing to 100 to 700 md. near the Mexia-Talco fault-line fields, in general agreement with core-analysis results. The suggestion is made that little effective communication occurs across the fault line.

On the other hand, the major conclusion appears to be that a satisfactory match of the pressure performance of East Texas field can be obtained by the reservoir analyzer when appropriate consideration is given to the influence of recovery from other Woodbine reservoirs. A convenient means is thus presented for predicting future performance, and it is shown, for example, that "if the present practice of returning 90 per cent or more of the produced water to the Woodbine formation is continued, an area-weighted pressure of 990 psi. can be maintained provided there is also a gradual decrease in the production rate." Further, it is concluded "that with the current practice of return of produced water, there will be sufficient water yield from the aquifer to produce East Texas field to depletion under the water-drive mechanism."

Lost Circulation Corrective: Time-Setting Cements

J. U. MESSENGER and J. S. McNIEL, JR., Magnolia Petroleum Co.

ATTENTION is called to the expensive damage incurred by lost circulation in the drilling of oil wells, and to the remedies usually employed. The latter are appropriately classifed with regard to advantages and limitations. Thus it is stated that adjustment of mud properties such as density and gel strength, while economical, is applicable only to mild loss of mud at shallow depths. The addition of bridging and plastering agents to the mud system while offering immediate protection without undue loss of rig time, is limited by the fact that mud loss into large crevices and cavities is not avoided. Use of conventional cementing materials, while usually satisfactory from the operating standpoint, is objectionable because of the expense of rig time loss during the cement-placement operation.

Use of conventional cement techniques to prevent mud loss is further objectionable because of the possibility of sticking the pipe, the probability of encountering hole deviation while drilling the cement plug, and sometimes because of the mud contamination which results. In any event, the authors of the subject paper propose the use of a new cement technique as the preferred remedy for lost mud circulation, and describe the advantages of the new technique both by general discussion of the subject, and by making reference to the results of comprehensive field tests.

The success of the new technique depends on the use of so-called time-setting cement, which is described as "consisting of an aqueous slurry of an especially selected clay, a smaller amount of an aluminum silicate to increase the strength of the set clay cement, and a retarder for increasing the pumping time of the slurry during application." It is further stated that "the properties of the slurry immediately after mixing are such that it may be first pumped down a well to the highly permeable zone responsible for lost circulation and then squeezed into the zone. After a relatively short period, the gel strength of the slurry increases to a very high level and becomes a plastic-like mate-

. . . Introducing Journal's New District Editor

Walter Rose comes to the Journal as new district editor at Houston, from Austin where he was assistant director of research for the Texas Petroleum Research Committee. At Austin he also held the rank of lecturer in the department of petroleum engineering at University of Texas.

Rose previously was employed by Gulf Research & Development Co., working under Dr. Morris Muskat, and before that was engaged in production and research activities for Carter Oil Co., at Tulsa, and Humble Oil & Refining Co., at Houston. Rose graduated from University of Chicago, is the author of more than 20 technical papers published in editions of A.I.M.E., A.P.I., Third World Petroleum Congress, and The Oil and Gas Journal, and is the inventor of several United States patents in the petroleum field.

Other editorial personnel in the Journal's Houston office, 802 Sterling Building, are F. Lawrence Resen and Lucy Dee Owen.

rial with sufficient strength, in most cases, to seal off the zone against mud losses during subsequent drilling operations." Evidently, the physical properties of the slurry immediately after mixing resemble those of a highly thixotropic drilling mud. The technique of placement closely resembles a cementing operation.

On the basis of tests using the time-setting clay cement on 12 wells in 6 fields where serious lost mud circulation was not improved by conventional means, the authors conclude that the success of their technique indicates it should be tried especially where other means fail. They show that because of low water loss and high gel strength, use of time-setting clay cement does not endanger sticking the pipe and will enter large formation cavities without dilution. Moreover, the final strength of the set cement is such that deviation of the hole while drilling the plug is not to be expected. On the other hand, the authors' cement technique seems to have some of the other disadvantages of conventional cement techniques, such as loss of rig time.

The Effect of Withdrawal Rate on the Uniformity of Edgewater Intrusion

M. MUSKAT, Gulf Oil Corp., Pittsburgh.

A COMMONLY expressed view regarding the intrusion of edgewaters into oil producing formations is that the geometry of such advance is rate sensitive. Muskat's paper deals with this subject.

Specifically, it has been suggested that high rates of advance, simulated by rapid withdrawals, will lead to "fingering" and an irregular type of invasion, whereas at low withdrawal rates the water encroachment will be more uniform. Two factors tend to support this view. One is the resultant effect of capillary pressure and gravity gradients in the displacement process involved in water intrusion, which are magnified at low rates of flow so as to improve the recovery efficiency. The other is the direct retarding effect of the rising water head as it advances upslope into the producing area.

The paper develops a generalized theory of edgewater intrusion where capillary effects are neglected, and gravity effects are alone considered. Although this generalization will not give a complete evaluation of the effect of the rate on water intrusion in nonuniform pays, it is stated by the author that at least a semiquantitative measure of the sensitivity of "fingering" to withdrawal rates will be indicated.

Calculations are reported, based on the indicated assumption that the water-oil interface advances as a sharp front, and it is found that, under such conditions, limitations of withdrawal rates will not greatly inhibit the "fingering" and bypassing tendency through high-permeability strata. An exception is made to this conclusion for the case where differential fluid head across the original oil column is of the order of (or exceeds) about 80 per cent of the driving pressure differential.

Results of Gas Injection in the Cedar Lake Field

R. M. LEIBROCK, R. G. HILTZ and J. E. HUZAREVISH, Stanolind Oil & Gas Co., Fort Worth.

THE various factors considered in recommending the initiation of a gas-injection project in the southern portion of Cedar Lake field are discussed. Performance history under gas-injection operations is reviewed and these data are analyzed, utilizing both the material-balance method and the fractional-flow and frontal-advance expressions.

Early in the life of Cedar Lake field, an extensive data-gathering program was initiated to provide an accurate record of reservoir-performance characteristics. From the study of these data it was apparent that there was a critical need for supplementing the natural reservoir energy in order to maintain well productivities and the maximum oil recovery. Accordingly, detailed engineering studies were made of the various methods of secondary recovery, and the decision was made to initiate a gas-injection program of sufficient intensity to maintain reservoir pressure at 600 psia., or 274 psia. above the bubble-point pressure.

In the words of the authors the paper should be regarded as a progress report on the success of this project, since some revision in interpretation is to be expected as more performance data are obtained.

The results of the study indicate that the injected gas has contacted and affected at least 50 per cent of the reservoir, and that a substantial increase in ultimate recovery can be expected. Moreover, productive capacities have been maintained substantially above the level predicted for primary operations. It is concluded that the performance of the Cedar Lake gas-injection project indicates the absence of any basis for classifying carbonate rocks in general as being inherently unsuited to a dispersed type of gas-injection program. Thus, it would appear that each field should be evaluated on its own merit regardless of whether production is obtained from a limestone or a sand.

The paper provides valuable reference material on the geology and stratigraphy of Cedar Lake field, and on the characteristics of the producing formation and of the reservoir and injected fluids. In disclosing in detail the method by which the problem has been analyzed, the authors provide guidance for others undertaking similar studies.

Method for Determining Wettability of Reservoir Rocks

R. L. SLOBOD and H. A. BLUM, Atlantic Refining Co., Dallas.

THERE are many problems which deal with the behavior of fluids in porous media of interest to petroleum engineers. The occurrence of the reservoir fluids such as oil, gas, and connate water in the pore spaces of the formation, and the transfer of these fluids from the formation to the surface during production are important subjects to be studied. Consideration of these subjects shows that wettability is basic in determining fluid-behavior phenomena.

Wettability is generally understood to refer to the way one fluid coexisting with another immiscible fluid will preferentially wet the walls of the solid container, and according to convention is measured numerically in terms of the contact angle at the point of interfacial contact between the immiscible fluids and the solid-phase boundary.

The subject paper treats the particularly complicated case of measuring the wettability characteristics of hydrocarbon formations containing reservoir fluids. This is done by use of core samples appropriately saturated with the reservoir (or reservoir-like fluids), but without direct observation of the contact angles. The latter would be exceedingly difficult because of the microscopic size and the surface irregularities of the pores, and is in fact the reason why up to the time of the present paper the wettability problem has remained largely unsolved.

Developed in the paper are theoretical considerations which indicate that comparison of two so-called displacement pressures (obtained in one case when oil is caused to enter the core sample fully saturated wtih connate water, and in the other case when air is caused to enter an oil saturated core) will give an indication of the oil-water contact angle and therefore of the wettability of the system. Such displacement-pressure data are conveniently obtained by the recently described centrifuge capillary-pressure method, but they may also be obtained by other standard capillary-pressure techniques.

The writers present data obtained on core samples representative of a number of formations, and show that the occurrence of intermediate wettability (viz, systems which are neither wholly water-wetted or wholly oil-wetted) are the rule rather than the exception. Further, the writers present evidence that routine handling of core samples during laboratory study sometimes results in nonreversable wettability changes. It is thus inferred that the results of laboratory core-analysis studies where wettability has been altered may in some cases not be representative of reservoir conditions.

Efficiency of Gas Displacement From Porous Media by Liquid Flooding

T. M. GEFFEN, D. R. PARRISH, G. W. HAYNES and R. A. MORSE, Stanolind Oil & Gas Co., Tulsa.

IN this paper the authors are concerned with showing by various tests that the nonrecoverable gas in hydrocarbon reservoirs subjected to liquid flooding is in order of magnitude several times larger than heretofore believed. They state, "instead of 1 to 15 per cent pore space, as is usually assumed, the residual gas saturation is 15 to 50 per cent pore space, and is thus of the same magnitude as residual oil after water flooding of oil sands."

To substantiate their conclusions the authors are careful to include results of field studies as well as the results obtained in the laboratory by core analysis. Thus, in one case cores were taken by the pressure core barrel from a watered-out gas sand to enable direct measurement of the residual gas saturation. In another case residual gas saturations in place were calculated from electric-log data obtained in watered-out gas sands. These tests, as well as four distinct types of laboratory core-analysis tests, showed invariably residual gas saturations in the range of 15 to 50 per cent pore space. The laboratory tests included relative permeability experiments, water-flood experiments on small and large cores, and capillary-imbibition experiments.

Incidental to the authors major objective of observing the magnitude of residual gas saturations characteristic of liquid flooding processes, the paper gives important information on the effect of flooding rate and the effect of temperature and pressure on recovery.

The Use of Models in Reservoir Engineering Studies—An Appraisal

WALTER ROSE and RALPH E. GILCHRIST, Austin, Tex.

AN examination is made of the subject matter of the science of reservoir engineering. It is seen that of the several remaining unsolved aspects, the estimation of reserves and recovery presents a problem of practical importance. This problem, as well as many others encountered in the study of reservoir engineering, is of such

complexity that rigorous analytical solution is not possible. This paper advocates the solution of these problems by use of models.

The basic postulates of dimensional analysis are reviewed in the paper, and the theory of model construction is described. Model types are classified as physical and analog models, scaled and unscaled models, and exact and verification models. Examples of these types are given, followed by a general discussion of the application of models for the solution of reservoir-engineering problems. Reference is also made to the limitations of model work and to the practical difficulties encountered in the laboratory construction of models. Finally, a new type of model called the "Fluid Mapper" is discussed both with regard to the underlying theory and with regard to possible specific applications.

The general conclusion is drawn that some of the advantages of model study have been largely overlooked by reservoir engineers. Specifically, it is concluded that model study provides the most suitable procedure for the evaluation of reserves and recovery factors. It is also concluded that the Fluid Mapper model technique offers promise for solving certain reservoir engineering problems which heretofore have defied analytical description.

Correlation of Radicactive Logs of the Lansing and Kansas City Groups in Central Kansas

JOHN V. MORGAN, Stanolind Oil & Gas Co., Tulsa.

THE paper first presents a generalized discussion of the geology of Central Kansas, and then elaborates on the characteristics and peculiar features of the Lansing-Kansas City (LKC) groups. It is pointed out that heretofore identification and correlation of the producing sections (Times) of the Lansing-Kansas City group have not been easily accomplished by standard procedures. On the other hand, the author's study of gamma ray-neutron logs and core data indicates that a zoning classification can be derived from the logs which is correlatable from well to well (over much of Central Kansas) to the main producing horizons. The author suggests a system of zoning and develops the necessary nomenclature, as an aid to the future development of commercial Lansing-Kansas City production in Central Kansas.

The paper contains detailed information on the producing characteristics of the several individual zones in the LKC groups, and gives a map showing the location of the various fields, as well as illustrations of gamma ray-neutron logs showing the major correlation possibilities.

The Determination of Performance Curve in Five-Spot Water Flood

WILLIAM HURST, Petroleum Consultants, Houston.

THIS paper presents an example of how physical analysis will lead to the solution of a problem of practical significance. The problem considered is the performance characteristics of the five-spot water flood for the ideal case of regular spacing in an isotropic formation (or in an anisotropic formation which can be represented by a series of superimposed isotropic layers). The results of the study "give the cumulative oil produced as a per cent of the recoverable oil in the formation vs. the total water injected, expressed as a per cent of the total floodable void space in the reservoir." Moreover, "the time for fill-up for the oil seal to reach the producing well, followed by breakthrough of the water flood are also indicated by the amounts of water injected." The oil-seal concept introduced by the author is discussed below.

Hurst starts off by giving the standard expression for the potential distribution characteristic of the five-spot field, and by stating without mathematical proof what is indicated to be a new expression for the streamline distribution. This allows the mapping of the encroaching water front as a function of time according to standard procedure. Hurst then introduces the concept that the oil in the vicinity of the injection well, in being displaced by flood water, must in turn displace residual gas before reaching the producing wells. This representation gives rise to the concept of an oil seal and to the concept of the fill-up time required for the oil seal to reach the producing wells.

In addition to the detailed figures showing the potential field of the five-spot pattern and the encroachment history of the flood water, the paper presents a comprehensive performance curve graphically portraying the author's theoretical deductions.

A New Additive for Control of Drilling Mud Filtration

R. A. SALATHIEL, Humble Oil & Refining Co., Houston.

FILTRATION rate is an important mud characteristic affecting the stability of bore-hole walls and influencing the ease of moving tools in and out of the hole. The author points out that whereas "it is seldom possible to determine precisely what filtration rate is required for the mud to perform its functions properly" as a rule of thumb low-filtration muds are to be preferred. The use of a new mud additive called SPIF is then described. This additive is the soluble salt of a very high molecular weight condensation product of sulfonated phenol and formaldehyde. Although the material is evidently not yet commercially available it is stated that the raw-product costs are moderate and the manufacturing steps are simple, and therefore a favorable manufacturing cost is to be anticipated.

The author describes the action of the additive as reducing filtration rate by plugging the small openings between mineral particles in the filter cake. Empirically this is indicated by extensive laboratory tests, and by the results of one field test where a SPIF-treated mud was employed. It is concluded that the material will control water loss from drilling mud and that the material is suitable for treatment of either fresh-water or salt-water muds. The observations are made that the new mud additive is not subject to fermentation, that it does not adversely affect viscosity or gel strength of the mud, and that its use does not require special mud-treating techniques.

Mobility Ratio—Its Influence on Flood Patterns During Water Encroachment

J. S. ARONOFSKY, Magnolia Petroleum Co.

ARONOFSKY has written a timely paper showing by experimental and numerical means that the mobility ratio will be an important factor affecting oil recovery. The mobility ratio is a number which compares the conductivity afforded by the reservoir to the transfer of the displaced and recovered-oil phase, to the conductivity associated with the transfer of the displacing water or gas phase. Elsewhere in the literature the influence of the mobility ratio on recovery has been discussed from the theoretical point of view, and this aspect is discussed fully in the subject paper.

For illustrative purposes the author has treated the case of the direct-line well-spacing flood pattern in an isotropic formation, and values of "break-through" recovery have been obtained for abritrarily chosen mobility ratios of 0.1, 1, and 10. Thus, breakthrough recoveries, which measure the total oil displaced at the particular time when the displacing water or gas first reaches the producing well, were found to be significantly related to the mobility ratios. Specifically, a 25 per cent variation in recovery was observed. In the words of the author the general conclusion is easily drawn that "effects of mobility ratio variations should be considered in . . . reservoir analyses where careful economic studies are desired."

Evidently, the work reported in the subject paper deserves continuation, especially to provide numerical values of quantitative significance for the less ideal but more realistic cases of unsymmetrical well-spacing patterns in anisotropic formations. Moreover, the importance of relating production rates, as well as relating recovery factors to the mobility ratio, is emphasized by the author. The comprehensive treatment given in the paper about the theory and application of the potentiometric model and numerical computation methods of analysis will be valuable reference material for those contemplating continued work.

The Guard Electrode Logging System.

JOHN E. OWEN, Geophysical Research Corp., and WALTON J. GREER, Halliburton Oil Well Cementing Co.

THE authors present a new scheme, called the Guard Electrode Logging System, which is intended to enable the accurate logging of formation resistivity without the necessity for considering resistivity departure effects.

The principles of the "Guard Electrode" logging device are illustrated in the paper by figures, and the underlying theory is developed in mathematical form in an appendix to the paper. In the words of the authors, "All surfaces of the bottom electrode assembly are kept at essentially the same potential. This Guard Electrode assembly is made up of an upper element, a measuring electrode, and a lower electrode.

An alternating current is passed between the bottom electrode assembly and the current return electrode. The path the current takes in going from the Guard Electrode assembly to the current return electrode through the earth is indicated by diagram. The all-important feature of this system is that the current from the measuring electrode flows outwardly in essentially a horizontal direction for a considerable distance, and hence is confined to a disc-shaped space having a thickness approximately the same as the length of the measuring electrode. Variations in earth resistivity within this disc-shaped region control the amount of current flowing from the measuring electrode."

It is indicated that the S.P. curve can be obtained simultaneously with the Guard Electrode resistivity curve. Several sample logs from South Texas fields are given to illustrate this, and to show the detailed response in the resistivity curve to formation lithological changes. The authors list as one advantage of the method the fact that resistivity logs can be obtained in holes filled with a high salinity mud. They conclude that use of this logging system "facilitates a more exact study of reservoir problems, even within relatively thin bodies" by virtue of the accurate recording of true formation resistivities.

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Authors' Own Digests of Papers

Engineering Study of the Cook Ranch Field, Shackelford County, Texas

WALLACE W. WILSON, Continental Oil Co.

THE Cook Ranch field produces from a very permeable lens of Cook sand of lower Permian or upper Pennsylvanian age, occurring at an average depth of 1,300 ft. The field was discovered in 1926, and has been operated with low pressure gas injection since July 1927, one of the first such projects in Texas. Cumulative recovery to December 31, 1950, was 14,701,131 bbl. of crude oil, an average of 1,013 bbl. per acre-foot of oil section, and 67.8 per cent of the oil originally in place. Analysis of the reservoir performance indicates that gravity drainage has been an important factor in the producing mechanism. The high permeability and uniformity of the reservoir were extremely favorable for this type of operation.

Equilibrium Vaporization Ratios for Nitrogen, Carbon Dioxide, Hydrogen Sulfide and Methane in Crude Oil-Natural Gas and Absorber Oil-Natural Gas Systems

R. H. JACOBY and M. J. RZASA, Stanolind Oil & Gas Co., Tulsa, Okla.

THIS paper presents experimental equilibrium vaporization ratios obtained for nitrogen, carbon dioxide, hydrogen sulfide, and methane in two mixtures each of crude oil-natural gas and absorber oil-natural gas. Temperatures covered are 100°, 150°, and 200° F., and pressures are from 200 to 5,000 psia.

A description is given of the high-pressure variable-volume windowed cell used in equilibriating coexisting liquid and gas phases. The pressure range of this cell is up to 20,000 psia. with temperatures up to 300° F. The cell avoids the use of mercury, volume being varied by means of a piston.

Experimental Evaluation of Well Perforation Methods as Applied To Hard Limestone

HENRY LEWELLING, The Atlantic Refining Co., Dallas, Tex.

AN experimental investigation of the relative effectiveness of standard bullets and "shaped charges" in perforating dense, hard carbonaceous reservoirs is described. A method is described which simulates the conditions under which a shot is normally used. Results are evaluated on the basis of depth of penetration, extent of fracturing, extent and nature of formation damage, and other physical characteristics.

Prediction of Saturation Pressures For Condensate-Gas and Volatile-Oil Mixtures

E. I. ORGANICK and B. H. GOLDING, United Gas Corp., Shreveport, La.

A SIMPLE correlation is presented for the prediction of saturation pressures in condensate-gas and volatile-oil mixtures. Saturation pressure is related directly to the composition of the mixture with the aid of two generalized composition characteristics, **B**, and molal average boiling point, and W_m, the so-called modified weight average equivalent molecular weight. The need for hydrocarbon equilibrium constants is entirely eliminated. Only the values of the two composition parameters need be obtained, and these are calculated in a simple and reproducible manner from the stream analysis of the mixture and the A.S.T.M. distillation for the heavy ends.

Here's Your Answer

H. H. RACHFORD, JR., and C. E. WILLIAMS, JR., Humble Oil & Refining Co., Houston, Tex.

AN electronic digital computer and its application to reservoir problems are discussed. A motion picture showing the fundamental operations as performed by the computer will be presented. The application of the computer to reservoir problems is illustrated by considering the problem of improving oil recovery from a dissolved gas drive reservoir by means of gas return to the reservoir.

An Analysis of the Evaporation Method for Determining Interstitial Water

CHARLES G. DODD, U. S. Bureau of Mines, Bartlesville, Okla.

A THEORETICAL study of the principles of evaporation of liquids from large pores in petroleum reservoir rock core

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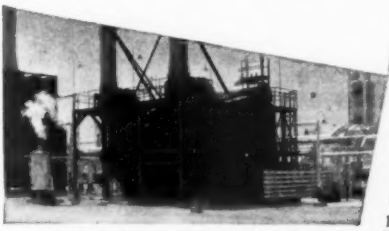
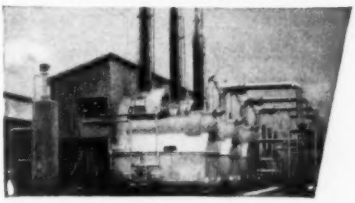
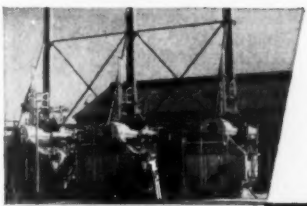
West Texas Natural Gasoline Plant



Central Texas Natural Gasoline Plant



Louisiana Refinery



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samples has resulted in the development of a working hypothesis to explain the application of evaporation measurements to the determination of minimum interstitial-water content. Rate-determining factors that control kinetics of evaporation processes have been considered in evolving the new hypothesis.

Variations in temperature during evaporation experiments are found to have a negligibly small effect on evaporation interstitial-water measurements. Determination of complete capillary-pressure curves by evaporation measurement is discussed briefly. Theoretical calculations indicate that minimum interstitial-water saturations determined by the evaporation method should correspond quantitatively with water saturations above transition zones in petroleum reservoirs. Experimental comparisons between the evaporation method and the well-accepted porous-disk method demonstrate excellent agreement.

The Effect of Circulating Media And Nozzle Design on Rock Bit Performance

L. L. PAYNE, Hughes Tool Co., Houston, Tex.

THE detrimental effect of various drilling muds upon penetration rate and footage drilled by rock bits has been recognized for many years. During the past 3 years, extensive laboratory and field tests have been conducted to determine the effect that different circulating media have on bit performance. Improvement in drilling muds has provided better control of the known conditions encountered in drilling a bored hole into the earth's crust. Unfortunately, some of the muds have a detrimental effect on the penetration rate and footage drilled by rolling cutter rock bits or blade type bits.

This paper presents data from laboratory and field tests of different drilling media circulated while drilling in formations ranging in hardness from soft shales to high strength lime, dolomite and chert. The volume of fluid circulated and nozzle position have a marked influence on bit performance and also affect hydraulic requirements.

Bridging Effectiveness of Perlite For Light Weight Cements And Lost Circulation

DON HALL, Great Lakes Carbon Corp., Long Beach, Calif.

THE need for light-weight cementing aggregate for use in oil-well cementing is reviewed and results are presented from laboratory and field tests of perlite-cement slurries. The slurries may be obtained from either high early strength or normal portland cements by the addition of perlite and bentonitic clay to control the weight and setting of the slurry.

Substitution of perlite cement for conventional slow-setting cements may give better completion results because the perlite cementing composition has lower setting strength, lower slurry density and greater slurry stability than conventional cement slurries. With the high bridging effectiveness of perlite-cement containing a percentage of bentonite, it is possible to place longer columns of cement slurries and reduce the possibility of having uncemented sections caused by the settling of cement particles before the cement sets.

Possibility of Cycling Deep Depleted Oil Reservoirs After Compression To a Single Phase

DONALD L. KATZ, University of Michigan.

THE compressing of gas into a partially depleted gas drive oil reservoir to bring the contents to a single phase miscible with gas is proposed as a process worthy of serious study. The compressed gas and vaporized oil would be recovered by cycling. This paper explores the possibility of recovering oil from reservoirs of 6,000 ft. or more by this method.

Visual Examinations of Fluid Behavior in Porous Media—Part 1

ALFRED CHATENEVER, University of Oklahoma, and JOHN C. CALHOUN, Pennsylvania State College.

A STUDY was made to examine the possibilities of a visual approach in investigations into microscopic mechanisms of fluid behavior in porous media. Appropriate apparatus and techniques were developed so that microscopic phenomena could be recorded on color movie film as well as be observed visually. The observation flow cells in which the fluid behavior studies were made were essentially single-layered matrices of spheres between plates. The fluids were limited to water and filtered crude oil.

Two flow regimes were observed during the flow of the heterogeneous liquids, channel flow and slug flow. In the former, transport was effected through stable networks of interconnecting channels; and in the latter, part of the movement took place in the form of slugs. Fixed front patterns were found to be different depending upon which liquids were the displacing and displaced phases. Residual formations of

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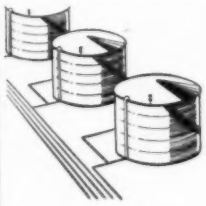

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oil and water were observed and are described.

Behavior of Dissolved Oxygen in Brine

D. C. BOND, G. A. MARSH and G. G. BERNARD, The Pure Oil Co., Crystal Lake, Ill.

IT is often assumed that aerated oil-field brines which are to be injected underground contain dissolved oxygen in amounts which will cause appreciable corrosion. Through the use of a new portable dissolved oxygen meter, accurate determinations were made at three brine conditioning plants.

At two older plants, dissolved oxygen concentration in the final treated brine was found to be almost zero in spite of aeration during the conditioning process. At a new plant, dissolved oxygen was initially present but disappeared soon after the brine was "inoculated" with oxygen-free brine from one of the other plants. Corrosion tests at the two older plants have substantiated predictions that the brines would not be corrosive. These results show that mechanical deaeration may not always be required in brine treating plants.

A Method for Predicting the Tendency of Oil Field Waters to Deposit Calcium Sulfate

HENRY A. STIFF, JR., and LAWRENCE E. DAVIS, The Atlantic Refining Co., Dallas, Tex.

A GRAPHIC method was developed which can be used to predict the tendency of oil-field waters to precipitate calcium sulfate under a variety of conditions. Application of the method is made to the prediction of sulfate scale formation in heater treaters, boilers, oil-well cooling systems and water-injection wells.

Hydrafrac Operations in the Spraberry Production, West Texas

WALDO L. GROSSMAN, Halliburton Oil Well Cementing Co., Midland, Tex.

DURING late 1950 and up to present date in 1951, the Spraberry sand production of West Texas has created widespread interest in the oil-producing industry. It is recognized that there are many controversial opinions concerning operations in the Spraberry, its economic value, and future development. The application of Hydrafrac procedures to completion of Spraberry wells has become prominent in the development of these sands. This paper outlines the geology and historical development of the Spraberry and the use of Hydrafrac applications in these formations

Displacement Mechanism in Multiwell Systems

LOYD R. KERN, The Atlantic Refining Co., Dallas, Tex.

A PROCEDURE for determining the behavior of a reservoir under a gas or water-injection program was reported by Buckley and Leverett in 1941. This method has been extended to apply to a more general situation. The reservoir may initially contain flowing quantities of the displacing fluid, or the fluid in the reservoir may be above saturation pressure so that solution effects are present. Production may occur behind the front as in the case of a well which is produced after breakthrough of the displacing fluid.

The calculating procedure is simplified in that the graphical integration necessary to determine breakthrough saturation is eliminated by performing a direct integration and the graphical differentiation necessary to determine saturation distribution

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is eliminated by representing the displacing phase fraction of the flowing stream by an empirical equation.

The Delta-Log, a Differential Temperature Surveying Method

R. B. BASHAM and C. W. MACUNE, Westronics, Inc., Fort Worth, Tex.

VERY small anomalies in oil-well temperature are detected and measured by surface recording the difference in temperature existing between two thermally sensitive elements which are spaced several feet apart on a small diameter carrier and lowered into the bore hole. The elements operate in a balanced electrical circuit and send only a reference signal to the surface as long as normal gradient temperatures are encountered. However, when the lower elements enters a temperature disturbance in the downward traverse, it unbalances the circuit and produces large recorder deflections for minute anomalies.

A Simplified Method for Computing Oil Recoveries by Gas or Water Drive

HENRY J. WELGE, The Carter Oil Co., Tulsa, Okla.

A USEFUL analytical improvement has been derived in the method for computing the oil recovery from a reservoir operating under gas drive, gravity drainage, or water flooding. Use of this improvement greatly simplifies the calculations because it makes unnecessary any numerical integrations. Plots of oil saturation against distance are likewise not needed. A further advantage of the method is that knowledge of the relative permeabilities is required for only a limited and intermediate saturation range.

In both the original and the improved methods, a linear sand section is assumed, and for the case of gas drive it is further assumed that the pressure is maintained sufficiently constant so that changes in gas density, solubility, or in formation volume factor are negligible. Thus, the methods contemplate oil displacement by an immiscible phase.

Effect of Data Errors on Typical Reservoir Engineering Calculations

CHARLES A. HUTCHINSON, JR., The Atlantic Refining Co., Dallas, Tex.

IN reservoir analysis important quantities such as reservoir pressure, in-place oil and well damage are calculated from directly measured quantities and each measurement error has an effect on the calculated result. This paper employs statistical methods in the quantitative consideration of the effect of these measurement errors on answers calculated by specific formulas which may be taken as typical of reservoir pressure, reservoir pressure decline, initial in-place gas in distillate fields, initial in-place oil in unsaturated fields, initial in-place oil in solution gas drive fields, and well damage.

Poza Rica—Its Development, Exploitation and Near Future

J. COLOMO, A. BARNETCHE and J. HEFFERAN, Petroleos Mexicanos, Mexico, D.F.

A DESCRIPTION is given about the development of the Poza Rica reservoir, production, number of wells, gas-oil ratios, pressure surveys. A brief discussion is given on the geology and initial conditions of the reservoir.

Future reservoir pressures for the next 4 years are predicted by the short-cut pressure-drop method and comparisons are made among different projects of water

and/or gas injection. A comparison is made, too, of ultimate recoveries under different programs of exploitation.

The Calculation of Pressure Drop in the Flow of Natural Gas Through Pipe

FRED H. POETTMANN, Phillips Petroleum Co., Bartlesville, Okla.

AN equation has been derived for use in calculating the sandface pressure of flowing gas wells in which the variation of the compressibility factor of the gas with pressure is taken into consideration. This variation due to compressibility has been put into both graphical and tabular form.

Comparison of calculated results with field measured results was made on 20 dry gas wells from a given field and 11 distillate wells from different fields. The agreement between calculated and observed results is good. In addition to their use in the calculation of sandface pressure of flowing wells, the factors can be used in the direct calculation of the static bottom-hole pressure of gas wells, the capacity of gas transmission lines, and in the calculation of the theoretical isothermal horsepower necessary to compress a natural gas.

An Application of Diffusity and Material-Balance Equations to a High Relief Pool

A. ROMERO JUAREZ and J. HEFFERAN, Petroleos Mexicanos, Mexico, D.F.

A METHOD that combines the diffusity equation and the material-balance equation is presented to determine the over-all porosity and mobility of the reservoir and water intrusion. The procedure is based on the formulas and tables developed by A. F. van Everdingen and W. Hurst, and is applied to the Poza Rica oil field which is a high relief pool.

An approach to the problem of locating the datum plane is given. A discussion of several proposed formulas for water encroachment is included and comparison is made between the results given by these expressions and those obtained by the unsteady radial flow theory.

Radial Filtration of Drilling Mud

C. L. PROKOP, Humble Oil & Refining Co., Houston, Tex.

A LABORATORY investigation has been made of the effects of mud hydraulics upon the formation and erosion of mud filter cakes. Tests were conducted to simulate drilling conditions as nearly as possible.

Formation of mud filter cake in a drilling well does not proceed at a uniform and unbroken rate. Instead, the rate of cake accumulation depends upon whether or not the mud is being circulated. If the mud column is quiescent, filter cake formation is a smooth function of the filtration characteristics of the system. If the mud is being circulated filter cake formation depends not only upon the filtration characteristics of the mud but also upon the erosive action of the flowing mud column.

Filter cakes formed during continuous mud circulation were observed to reach an equilibrium thickness after several hours' circulation. Mud circulation was maintained at a constant volumetric rate throughout each experiment. The fluid velocity at equilibrium cake thickness was dependent upon the thickness of the filter cake. Muds having exceptionally high water loss deposited thick filter cakes in spite of very high eroding velocities. The muds having good filtration characteristics deposited thin filter cakes at equilibrium circulating velocities well within the range of those used in a drilling well.

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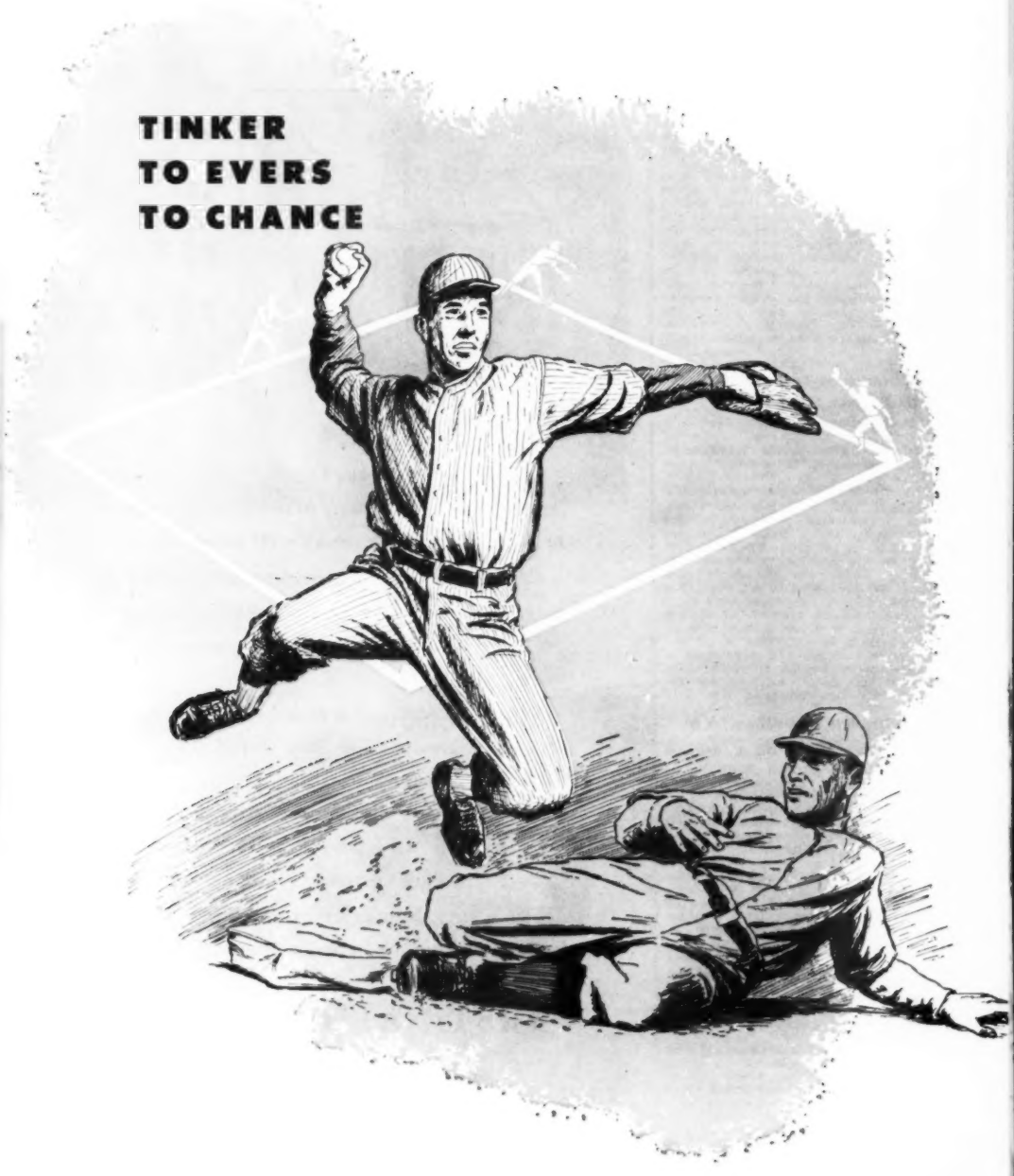
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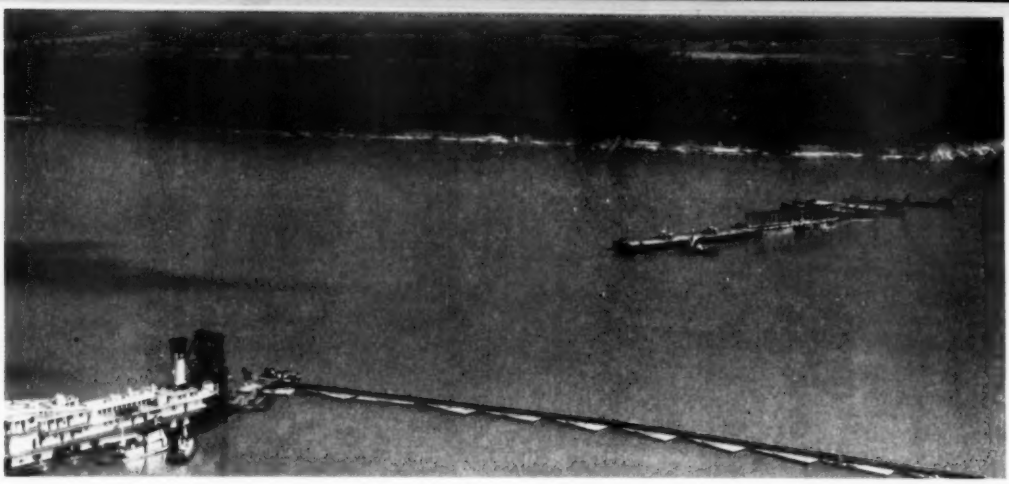


Construction operations on Trunkline's Mississippi River crossing. Special barge which handles 24-in. pipe with chain hoists traveling on overhead frames, is positioned at far side of river in this view. (Photos by Robert Yarnall Richie.)

Trunkline's Mississippi River Crossing

Important departures from usual practices feature crossing of twin lines 13 miles south of Greenville

by Paul Reed
Pipe-Line Editor

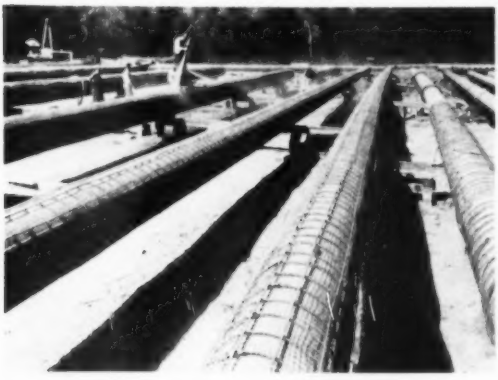
THERE are several important departures from usual practices in the laying of two lines across the Mississippi River by Anderson Brothers Corp., for the large transmission system now under construction for Trunkline Gas Co.

The crossing consists of two 24-in. lines, 13 miles south of the Greenville, Miss., bridge. The principal innovations were the application of reinforced-concrete jacketing and the utilization of an unusual pipe-laying barge equipped with a series of chain hoists operated from tracks supported on overhead frames.

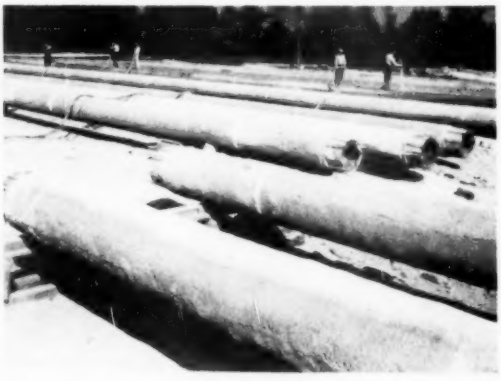
Operations for coating and jacketing of 200-ft. sections were handled by Anderson Brothers yard on the Arkansas side of the river. From there the long sections were taken by supply barges, each carrying six sections, to the laying barge which worked from the Mississippi side.

Over the coal-tar coating, concrete ($2\frac{1}{2}$ in. thick) jacketing was applied in the following way. Steel mesh reinforced by four $\frac{1}{2}$-in. horizontal

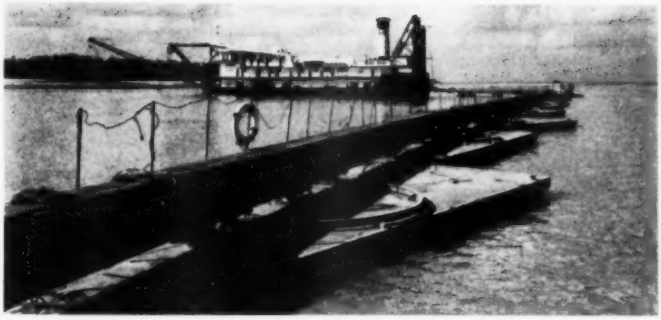
Applying cement mixture on reinforcing.



Steel mesh reinforcing was placed over coal-tar coated pipe.



Cement coating was not applied to pipe ends until after welding.



Dredging equipment used in constructing the two 24-in.-line river crossing.

bars was held away from the pipe at a distance of 2½ in. by means of spacers placed at 10-in. intervals.

The cement mixture for each foot of 24-in. pipe consisted of 35 lb. of cement, 74 lb. of sand, and 149 lb. of barium sulfate. The barium sulfate was included to increase density of the concrete so that the most effective weighting effect could be procured by 2½ in. of concrete jacketing. A typical mixture was 100 lb. of cement, 200 lb. of sand, and 400 lb. of barium sulfate. Total weight of the coated and jacketed 24-in. pipe was 450 lb. per foot.

The cement mixture was applied by the Gunite method. For the crossing project, three Gunite guns were operated on the Arkansas shore for the main job of jacketing. One gun on the laying barge covered the short spaces adjacent to welds for joining 200-ft. sections with the remainder of the line.

The laying barge was originally constructed according to the designs of Carl Anderson, with chain hoists for the laying of Ozark Pipe Line System's Mississippi River crossing near Hartford, Ill. Subsequently it has been reinforced and improved by reconstructing the bow so that more room is provided for the convenience of welders. One advantage of the chain-hoist-type of laying barge—sometimes called the "rampless ramp barge"—is that it eliminates need for having a big derrick crane barge to handle the 200-ft. sections.

Furthermore, the chain hoists suspended from overhead trolleys provide a flexibility in handling the pipe which results in better control than is possible with a ramp barge. A boom at the bow of the barge holds the pipe on a cradle as it goes in the water.

Both of the crossing lines were laid at depths of 15 ft. below the bottom of the river. The first line was laid in a trench. The second line was laid without a trench and was lowered to the specified depth by subsequent dredging.

The whole operation was conducted in the late fall and early winter of last year when the river was unseasonably high contrary to long-range predictions based on river records. At times there was a depth of 55 ft. from the top of the river to points where the pipe was laid.

BOOKS

INDUSTRIAL WATER POLLUTION. Survey of Legislation and Regulations. Compiled by the staff of R. S. Aries & Associates. Published by Chemonomics, Inc., 400 Madison, New York 17. 142 pp. $5.

This handbook lists and discusses the regulations on water pollution now in effect in every state and territory of the United States. It is a ready reference work, presenting the various definitions of water pollution, the measures necessary to comply with the states' regulations, the enforcement procedures enumerated in the laws, the steps which must be taken by manufacturers to abate water pollution.

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CORROSION and its control

Designing Against Corrosion

PROPER attention to certain details in the design and construction of a pipe-line system can pay large dividends in the costs of fighting corrosion. This is obviously true in the selection and application of the coating, but it is also true of a number of apparently minor and irrelevant details as well. Some of these pertain to features which will diminish the corrosive attack on the pipe, and others—no less important—to those details of construction which will make cathodic protection less expensive and more effective.

Leaving out of present consideration the coating, which is directly and obviously relevant to corrosion and to cathodic protection, there still remain many details to be attended to, among which may be named the following:

1. **Insulated joints.**—The use and importance of these joints in sectionalizing a system, or in isolating it from systems whose protection is not desired, has been discussed in No. 18 of this series.

2. **Casing supports and casing bushings.**—These relatively inexpensive devices insure that the pipe line is not short-circuited to the casing at road and railroad crossings. Such a short-circuit places an excessive drain upon any cathodic protection which may later be installed, since the totally bare casing will require as much current for protection as many miles of well-coated pipe. And, although the protection of the casing may not be desired, it is impossible to protect the pipe line without protecting the casing when the two are in good electrical contact.

In addition to increasing the current requirements of a line, short-circuited casings represent radical departures from uniformity, and thus severely limit the choice of locations for protection units. It may be necessary to install a unit in unsuitable soil, so that the operating costs per delivered ampere are two to five times as great as for more favorably located sites. The attenuation characteristics of a well-coated line are such that a very wide freedom of choice exists for the location of units, and only the most favorable sites need be used.

3. **Adequate separation from crossing lines.**—The danger of interference between two crossing pipe lines is much greater when the lines are very close together at the crossing point. If either of the lines is under cathodic protection, there may be damage inflicted upon the other line at this point. Even if the proper precautions—crossbonding—are taken, the additional power required to prevent damage to the foreign line is greater when the lines are close together. The additional cost of providing a separation of at least 12 in., or even more, is not excessive, and the savings effected are more than enough to justify this measure.

In addition to adequate separation, particular attention to the quality of the coating for several feet on either side of the crossing will decrease the exposure. As a matter of ordinary fair dealing, any damage done to the coating of the foreign line should be carefully repaired; and even where no damage has been done, the application of a few feet of high-quality coating to every line crossed—even bare lines—will result in a better installation, and in decreased cathodic protection costs, on the line under construction.

4. **Test leads.**—The installation of properly spaced and located test leads as a part of the original construction program will facilitate the work of surveying and supervising the corrosion-control program—and anything which makes this complex operation simpler will reduce the over-all costs of corrosion and corrosion mitigation. No. 16 of this series discusses the location and installation of test leads in some detail.

5. **Electrical continuity.**—No. 18 of this series treats of the bonding of nonconducting coupling devices. These are of more common occurrence on gas lines than on those carrying liquids. Particular care should be taken that any such joints installed should be bonded, and maintenance forces must be strictly enjoined against the practice of inserting such joints on repair jobs, and making no record to that effect. It is quite obvious that the cost of bonding these joints when they are installed is very small compared to the cost of excavating and bonding—even when the locations are known; and even smaller compared to the high cost of locating an unknown number of such joints and bonding them. Without complete electrical continuity, a cathodic-protection system may very well do a great deal more damage than natural corrosion.

6. **Avoidance of unnecessary exposures.**—Present techniques of coating and of cathodic protection make it possible to control corrosion in even the worst of soils and waters. Nevertheless, there are many occasions where a very slight relocation of a pipe line would avoid a particularly bad area, and at little or no cost. In at least one actual case, a line was staked through several slush pits and one salt-water pit. It was not constructed, but the relocation was probably impelled more by the desire to avoid difficult construction problems, rather than to avoid these corrosive areas. In many other instances, however, no relocation was made, and lines run through aggressive soils which might easily have been avoided.

Part 31 of a series by Marshall E. Parker, consulting engineer, Houston.

QUESTIONS on TECHNOLOGY

by W. L. Nelson
Consulting Engineer

Instruments for Absorber-Fractionator

What instruments can be used on a so-called absorber-fractionator such as those used in some cracking plants and sometimes in demethanizing hydrocarbon mixtures? H.S.F.

Combination absorbers and fractionators are extremely complicated in their operation because a carefully fractionated bottom product is required and at the same time no one wants to accept any loss of the desired key component through the absorber. Thus, if the bulk of the component is retained at the bottom by maintaining a fixed bottom temperature, the absorber must catch exactly the right amount of the component—not more and not less than the amount that can find its way out the bottom or fractionating part of the system. Nor is there any substantial reflection in temperature, pressure, or other common variable by which the absorber can be regulated.

The rate of oil flow to the absorber or the oil temperature to the absorber has only one setting for each fractionator bottom temperature. To the knowledge of the editor of this page, no means of complete automatic control has been devised. The bottom temperature is fixed by control, the feed temperature is controlled, and the temperature at the top of the fractionating section can be controlled, but the oil flow to the absorber must be set by hand by a series of adjustments which is complete when only slightly more of the desired component is lost from the top than is required to maintain the bottom composition. In other words, the bottom temperature is set (with respect to the absorber) so that a small amount of the desired component is rejected from the bottom and forced to leave through the absorber. Too much absorption oil only results in capturing component that cannot leave the system with the bottom product and hence the column floods. One such absorber-fractionator is instrumental in an actual plant installation in the simple way indicated in Fig. 1. Great skill is required in its operation.

The diagram shown here applies to the use of an absorption medium that is withdrawn along with or as part of the bottom product. Similar difficulties with control arise even if a regular absorption oil is used and it is withdrawn from the center of the column as a rich oil. Such oil either goes back to the cracking-plant fractionator thereby delivering the troublesome key component or fraction back to the absorber-fractionator, or it goes to its own rich-oil stripper where the troublesome component is removed and then returned to the absorber-fractionator. Of course, if the cycle is broken at some point by allowing part of the troublesome component to be delivered to some other recovery system, then the control of the absorber-fractionator is greatly simplified.

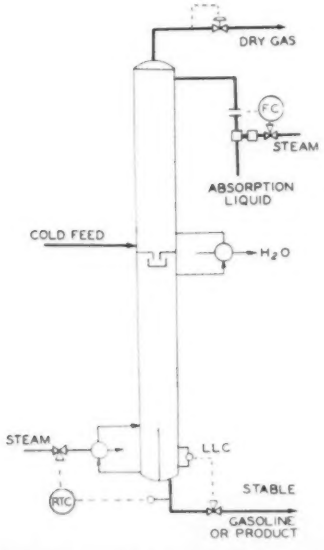

Fig. 1—Instrumentation of an absorber-fractionator.

Cost of Carbon-Black Plants

What is the cost of carbon black plants for operation on oil? S.M.T.

The approximate construction cost of oil-black plants since 1946 has remained somewhat constant at about 4.5 to 7 cents per (yearly) pound for plants ranging in size from 25 to 50 million pounds per year. Thus, improvements in design have been overcoming the increases in labor and material costs. However, a plant now being completed in England is expected to cost about 12 cents per (yearly) pound.

Instruments for Stripping Still

I will appreciate any information you may have on the instrumentation of stripping stills of the type used in the natural-gasoline industry. H.S.F.

With respect to rich-oil stripping stills, the instrumentation is relatively simple because there is somewhat of a gap between the boiling range of the oil and the boiling range of the absorbed components. Thus, the top temperature can wander around to some extent without permitting any of the absorption oil to pass overhead.

The purpose of a rich-oil stripper is to produce a lean oil that contains only traces of pentane or isopentane (or similar key components). This is accomplished simply by a bottom temperature controller which regulates the amount of steam that heats the incoming feed or in some plants a steam heated reboiler. Many plants operate without any bottom temperature control. Meanwhile, steam for stripping is admitted at a constant rate usually without any control other than its pressure although a rate of flow control can be employed.

The upper part of the stripper is really a fractionator but it does not produce a top product that is at its boiling point; the overhead product is highly superheated. Thus, the purpose of the reflux is to condense the lightest components of the absorption oil, not to reject some of the overhead (or gasoline) product. For this purpose, the reflux can be set at a constant rate by a valve setting but it is more common to employ a rate of flow controller.

Of course, the pressure must be controlled and the liquid levels must be controlled. Levels are controlled by releasing liquid through valves actuated by level controllers. Pressure may be controlled by regulating the flow of water to the condenser or by releasing gas. These features are indicated in Fig. 1.

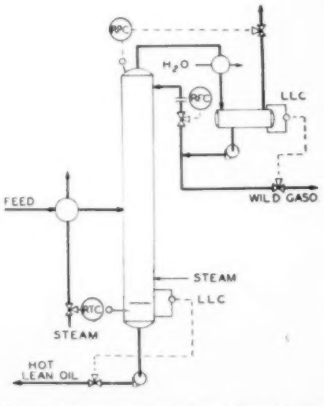

Fig. 1—Instrumentation of gasoline stripper.

Pulsation Dampeners in Compressor Piping Systems

(Continued from page 110)

These results indicated to us that the devices would be effective, and we contracted for their installation. The pressure drops through the dampeners were approximately 10 per cent of the pressure drops which had been required across the pinched valves. The results were entirely satisfactory. However, we later decided to rotate the vertical expansion loops in the laterals to the horizontal position to eliminate a small amount of vibration believed to be due to mechanically transmitted disturbing forces originating from acceleration of the reciprocating parts of the engines.

Gas-Measurement Improvement

Our next application of pulsation dampeners was made solely for the purpose of improving the gas measurement at a natural-gasoline plant. This plant was served by five horizontal, 250-b.-hp. compressors, each operating at 200 r.p.m. and each equipped with two double-acting compressor cylinders. Gas was boosted in two stages from an inlet pressure of 15 psig. to a final discharge pressure of 450 psig.

The intake meter was approximately 100 ft. distant from the point of connection of the field line to the compressor suction header. To obtain a readable chart it was necessary to place a restricting orifice in the manometer tube. The resultant reading, however, could not be made to agree with the sum of the field meters. Pulsations from the discharge side of the compressors had a similar bad effect upon some of the plant process meters.

There are several ways in which pulsative flow may affect orifice meters. If the frequency of the pulses approximates the natural frequency of the manometer, the mercury may be forced into violent oscillations. The natural frequency of most mercury manometers is low enough to avoid this. The pulse frequency is given by the following formula:

$$360°/\text{C.A.} \times \text{RPM}/60 = \text{Frequency}$$

C.A. = Maximum crank angle between compressor cylinders, including apparent crank angle of each cylinder, which is:
Single-acting, 360°
Double-acting, 180°
Frequency = pulses per second.

However, even if the disturbance is small, it may have a serious effect upon measurement if the frequency of the oscillation is in resonance with the recording system or some component of it, such as the pen and pen arm.

Another effect may be caused by the manifold, meter piping, and meter pots. Reference to Fig. 1 brings out the similarity of orifice-meter piping to a pulsation dampener. The meter manifold upstream of the orifice represents one volume chamber, the upstream meter pot represents the other. The meter piping, which is usually of small diameter, represents the connecting tube. A similar construction exists downstream of the orifice. These, as explained before, constitute low-pass acoustical filters. If they are not identical, the pressure waves acting on the mercury in one pot will differ from those acting on the mercury in the other pot, and serious errors in measurement may result.

In our case, the installation of a single pulsation dampener in the field line between the meter and the suction header cured the difficulty. A similar installation made in the plant discharge line stopped the interference with the plant process meters.

Both the users and the manufacturers of compressors have long been concerned with designing compressor piping to give optimum compressor performance. Thiel[5] has proposed a method for sizing suction and discharge laterals. Some compressor manufacturers, upon request, provide

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a manual for sizing headers, laterals, and cylinder surge chambers. Both of these treatises are concerned with minimizing pressure loss due to gas flow. Neither considers the possible ill effects of pressure waves. Probably the most complete treatment of this subject is contained in the doctoral thesis prepared by Dr. Eugene Murphy[2].

Natural Frequency of System

Murphy has developed a system by which the natural frequency of vibration of even the most complicated system of piping may be determined. The system is broken up into "lumps" of pipe. The length of the lump is from one-tenth to one-twentieth of the wave length for the suspected natural frequency. Through the use of electrical analogs and scale factors, the natural frequency of the piping system is then computed on a network calculator. If this is done during the design stage, and the system is found to be in resonance with the fundamental frequency of the compressor cylinders, or an important harmonic thereof, design can be changed to avoid this.

From Murphy's work it can be concluded that orifice plates and the resistance of the piping have little effect on the natural frequency of a piping system. Surge chambers, however, have a very pronounced effect in lowering the natural frequency. Some of Murphy's results compared with Voissel's results on a single-cylinder compressor are shown in Table 2, in support of this.

Concerning the use of surge chambers Murphy states: "When . . . occurs in practical systems, the owners or designers usually feel that a larger surge chamber (or manifold in the case of multiple cylinders) is needed. The supposition is that no resonance would take place if the pipe between the cylinder and the entire atmosphere were negligibly short, so that puffs of gas would immediately dissipate in the atmosphere. The addition of a fairly large surge chamber near the cylinder is thought to approach the desired effect. The flow in the secondary pipe beyond the surge chamber is assumed to be smooth and substantially nonoscillating.

"The experiments of Voissel and Framer and the analogous electrical studies here reported as well as the studies on generalized systems, reported below, indicate that such a simple picture may be misleading. Surge chambers should be added or increased in size only with the knowledge of existing natural frequency of the entire piping system.

"Misguided addition of surge chamber volume might merely lower the natural frequency from a value somewhat above resonance with the important harmonic of the compressor speed to substantially that harmonic. Then the total pulsation of the gas would be increased from a substantial forced oscillation to a more severe resonant vibration."

On the use of filters Murphy comments as follows: "The analogy might be used to design acoustical filters or mufflers designed to pass the direct flow with minimum pressure drop, and yet to reduce (attenuate) the oscillating components over a reasonable range of compressor or engine speeds. The aim would be to use minimum resistance but properly proportioned inductances and capacitances.

"Any proposed design of filter could be checked in analogous electrical form. The extensive information on electrical filters (chiefly for telephone and radio service) could be transformed into acoustical terms. Unless such a filter is contemplated, however, the frequent practice of resigning surge chambers in a certain ratio to the volume of the cylinders without regard to the remainder of the piping system seems hazardous."

This discussion concludes with a very brief description of the piping in our latest plant. In this plant one of the volume chambers of the pulsation dampener is used as the surge chamber at each unit. The other volume chambers are laid end to end and, separated by orifices, they comprise the header. The tube connecting the volume chamber located in the header with the volume chamber at the compressor thus becomes the compressor lateral. This arrangement has also been described by Stephens.[7] It is shown diagrammatically in Fig. 3. Note the absence of expansion bends. Suitable provision for lateral and longitudinal movement of the piping makes their use unnecessary.

We have not actually checked the performance of the compressors using pulsation dampeners, or the dampening system, by means of indicator cards. This is due, in part to the difficulty of obtaining accurate cards on the type of machine being used, and in part to the lack of an indicator for use in the higher pressure ranges. However, the output of the compressors is essentially that which would be predicted from the header pressures. And fuel consumption and exhaust temperatures indicate that the engines are not overloaded when operating at rated speed and at rated compressor suction and discharge pressures. Because of this, and the vibration-free piping it assures, we have become consistent users of pulsation dampeners on all permanent compressor installations.

TABLE 2—COMPARISON OF VOISSEL'S EXPERIMENTAL RESONANT FREQUENCIES WITH THOSE OBSERVED ON ANALOGOUS CIRCUITS UPON THE NETWORK CALCULATOR

	Voissel experimental r.p.m.	Equivalent circuit on calculator r.p.m.
I Plain pipe, 22.5 m.	260	260
II Plain pipe, 26.0 m.	220	222
III Plain pipe, 24.6 m.	218	222
IV Plain pipe, 24.6 m., sharper elbow	210	219-222
V No suction valve; plain pipe, 24.6 m., sharp elbow as in No. IV	217	(219-222)
VIII Surge chamber 2.88 m. from compressor, total 24.6 m. of pipe	170	172-173
IX Surge chamber 7.42 m. from compressor, total 24.6 m. of pipe	178	180-182

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1. Arnold, Marion L., Vibrations in Compressor Piping, The Oil and Gas Journal, January 6, 1945, pp. 54.
2. Murphy, Eugene F., Doctoral thesis, Illinois Institute of Technology, June 1948.
3. Stephens, Foster M., U. S. Patent 2405100.
4. Hirschorn, Martin, Chemical Engineering, September 1949.
5. Theil, B. C., Petroleum Engineer.
6. Murphy, Eugene F., California Oil World, first issue, February 1949.
7. Stephens, Foster M., U. S. Patent 2474555.

BOOKS

THE OIL RECORD (1951). Published by Petroleum Industry Projects, Box 829, B.F. Station, Washington 4, D. C. 360 pp. $6.

The second annual edition of this directory lists more than 300 oil and natural-gas companies in its index and treats 115 of these in detailed data. Additional information has added 128 pages over the 1950 edition. A feature of the new edition is the company comparison tables showing rank order of many companies by crude reserves, production, wells drilled, and refinery throughput. Computed indexes are given, such as dry holes as per cent of wells drilled, production as per cent of refinery runs, income as per cent of total capitalization, etc. Statistics are generally carried over a 3-year period. Added to the new edition is a section on pipe lines listing 75 principal organizations in the petroleum pipe-line field with officers and addresses. The publication is prefaced by industry-wide summaries of foreign and domestic oil developments for 1950. The publication is confined to United States companies except for a few Canadian and Venezuelan companies which have especially close ties as subsidiaries of American companies and the stock of which is publicly held and traded in this country. Information also is included on Arabian American Oil Co. because of its strategic importance to the American industry. All material included is official company information or computed therefrom except in designated cases of crude and gas reserve estimates.

SCIENCE FRENCH COURSE. By C. W. Page Moffatt. Revised by Noel Corcoran. Published by Chemical Publishing Co., 26 Court Street, Brooklyn. 332 pp. $4.75.

The title of this book sufficiently indicates its purpose, namely to provide students who have to read French books on scientific subjects with the necessary minimum of grammar and a selection of abstracts from which a little preliminary practice may be obtained. In preparing the third edition, certain parts in the grammar section are omitted; the object has been to retain sufficient matter to enable the science student or practicing scientist to read technical matter in French, without devoting too much space to the niceties of translation into French. In particular, the paragraphs dealing with the uses of the subjunctive have been greatly condensed.

Displacement Rate and Efficiency

IN any discussion of flood advance it is desirable to distinguish between rate of advance and efficiency of flood. Both of these are dependent upon the mechanism by which water displaces oil and because of the complete lack of understanding about this displacement process neither rate nor efficiency can at present be truly calculated.

The only present approach to efficiency is by means of empirical data or by use of relative-permeability information. Empirical data are lacking because of the uncontrolled variables present in most displacement experiments or field operations. The approach based upon relative permeability is incomplete because a flood front must be assumed before calculations can be made. Even then, this approach must make use of a known volume of water injected and can not be used to give rate of flood advance. This particular method has been discussed in some detail in Engineering Fundamentals Nos. 457-462.

Although the assumption of a flood front with no oil movement behind it does not agree with known experimental fact in all cases, it does permit the calculation of a rate of flood-front advance. This has been outlined in Engineering Fundamental No. 455. Thus, we have at our disposal two incomplete approaches, one which permits a calculation of rate of advance but not efficiency, and one which permits some calculations of flood efficiency but not rate of advance.

In any event, it is generally conceded that the efficiency of a flood advance is predominantly determined by the relative permeability character of the rock (particularly the nature of k_w/k_o versus water saturation), the wettability, the fluid viscosity ratio, and the amount of gas present. The rate of flood advance, on the other hand, is predominantly determined by absolute permeability and by oil viscosity. For a given reservoir, therefore, it can be anticipated that the rate of flood advance will be mainly dependent upon permeability variation because oil viscosity is uniformly fixed.

There have been only two relationships proposed in the literature. The assumption made by Stiles[1] is that rate of flood advance is strictly proportional to permeability. The assumption made by Dykstra and Parsons[2] is that the flood advance is determined by Darcy's law expression for two permeabilities in series, that to oil ahead of the flood front and that to water behind the flood front. The assumption of Yuster and Calhoun[3] for flood rate in radial systems is essentially the same as that of Dykstra and Parsons.

For want of a better starting point and because of the nature of sedimentary processes, it has generally been assumed, in making calculations based on permeability variations, that the variation is all in the vertical direction. Thus each horizontal layer of a reservoir is assumed to be homogeneous and behave as though it were sealed off from all communication with other layers above or below.

Having assumed no crossflow in a reservoir and having a knowledge of the uniform permeability values to assign to horizontal layers one can use the known relationship between rate of flood advance and permeability to calculate the over-all field performance. This performance is generally given in terms of cumulative oil production versus water oil ratio rather than versus time, however.

Fig. 1 will suffice for explanation. Consider the several noncommunicating intervals of permeable rock. For simplicity, the intervals are given in order of decreasing permeability although this is not essential. When the flood front has just reached the outflow end of interval i, all those of higher permeability are producing water and all those of lower permeability, including i, are producing oil. Just after flood breakthrough at this layer the water production has increased by the capacity of the ith layer and the oil capacity has decreased by the same amount. At this time of breakthrough also, the total oil production will be the total production from the intervals more permeable than the ith interval, including that interval, plus the fractional amount from all those layers of lower permeability than i. If the relationship between flood advance and permeability is known, this fraction can be computed. Thus the cumulative oil production can be correlated with a given water oil ratio.

Inasmuch as this calculation can be repeated for breakthrough at any layer of permeability from the highest to the lowest, it follows that a complete history of water oil ratio versus cumulative oil production will result.

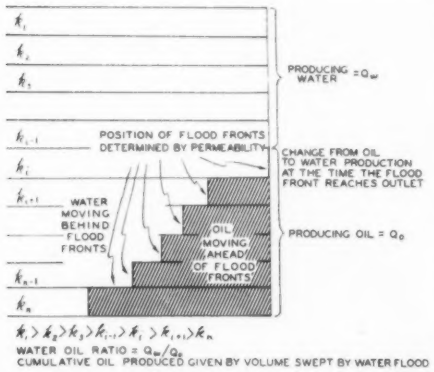
PRODUCING WATER = Q_w
POSITION OF FLOOD FRONTS DETERMINED BY PERMEABILITY
CHANGE FROM OIL TO WATER PRODUCTION AT THE TIME THE FLOOD FRONT REACHES OUTLET
WATER MOVING BEHIND FLOOD FRONTS
OIL MOVING AHEAD OF FLOOD FRONTS
PRODUCING OIL = Q_o
$k_1 > k_2 > k_3 > k_{i-1} > k_i > k_{i+1} > k_n$
WATER OIL RATIO = Q_w/Q_o
CUMULATIVE OIL PRODUCED GIVEN BY VOLUME SWEPT BY WATER FLOOD

Fig. 1—Schematic diagram showing manner in which permeability variation can be used to give flood performance.

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1. Stiles, Use of Permeability Distribution in Water Flood Calculations, A.I.M.E. Trans. Vol. 186, 1949.

2. Dykstra and Parsons, Oil Recovery Prediction by Water Flood, Secondary Recovery of Oil in United States, second edition, A.P.I., 1950.

3. Yuster and Calhoun, Behavior of Water Injection Wells, Producers Monthly, Nov. 1944.

Series by John C. Calhoun, Jr., Chairman, Petroleum Engineering School, Penn State College

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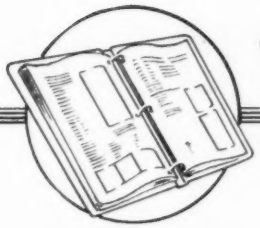

THE REFINER'S notebook

No. 92

Fire-Clay Refractories

by Ray A. Witschey*

HAVING classified refractories and discussed their properties and behavior, it will simplify the discussion to examine in greater detail the members of the fire-clay group.

Fire-clay brick. — The American Society for Testing Materials lists seven different classifications of fire-clay brick, designating them as Low-Duty, Intermediate-Duty, High-Duty, Super-Duty, 50, 60, and 70 per cent Alumina-Diaspore Fire-Clay Brick. Another classification (not yet listed by A.S.T.M.) is known as Special Super-Duty Fire-Clay Brick. This brick is essentially a super-duty brick burned to much higher than normal burning temperatures. The classified fire-clay brick are generally burned to about Cone 14, while the Special Super Duty are burned to Cone 18 or above.

This fire-clay group of refractories covers a wide range of products. Chemically, they range all the way from 30 to 70 per cent alumina. The range in chemical and mineralogical characteristics is apparent. This group constitutes a wide range of properties that find wide application in industry. Not only chemically and mineralogically but by virtue of differences in physical structure the application of this group is still more diverse. Some of the methods of forming or manufacturing these products are described in order to understand better this factor.

Conventional methods.—Requirements of specific service conditions and requirements for mass production in the industry have resulted in the use of several methods of manufacturing or forming fire-clay refractory brick and tile. Three methods generally used are (1) hand made or wood mold, (2) stiff mud or extruded, and (3) dry press or power press.

*Ceramic engineer, A. P. Green Fire Brick Co. Portion of paper presented at John Zink Heating Seminar, Tulsa, 1951.

The hand made method is largely limited to the manufacture of special or odd shapes that do not lend themselves to machine methods.

The stiff-mud process is used where the product must have a dense, close-grained, tight compact structure. It is confined almost entirely to the low-duty, intermediate-duty, and high-duty groups. Characteristics of stiff-mud refractories are maximum strength, and resistance to abrasion and to corrosive action of slag.

The dry-press process is more generally used. It lends itself to volume production, with close control over grain sizing, strength, and density. Less moisture is used in forming, making it possible to form lower shrinkage products. Brick and tile of greater uniformity and better spalling resistant characteristics can be manufactured.

Special Methods

The great demand for special shapes, and particularly shapes of specific properties, has resulted in the greater utilization of special methods. "Slip casting," or forming from slurry mixtures of clays, is used in special cases. "Air hammer" tamping processes are used extensively. These methods may be employed for conventional fire-clay mixes, comparable to "wood mold" mixes previously described. A "Special Air Hammer" process in which extremely high percentages of calcined grog, grain sized for maximum density, has been developed. This process permits the formation of shapes that show almost negligible shrinkage (1/16-in. per foot as compared with 1/4 to 1½-in. per foot used with methods previously described). This permits the manufacture of special shapes to extremely close dimensional specifications, and bodies that compare to dry press process bodies in physical properties.

The effect of two different methods of forming are indicated in Table 1 which shows approximate physical properties of high-duty brick made from the same basic material.

Insulating firebrick. — Another category of products is that known as insulating firebrick. These are generally made from fire clays which include some combustible material such as saw dust or cork in the mix which, when the refractory is fired, leaves a porous structure that gives the insulating property.

A.S.T.M. classifies the insulating firebrick into five groups according to the maximum recommended service temperature, ranging from 1,600° to 2,800° F. Insulating firebrick suitable for still higher temperatures are being produced. Insulating firebrick and tile find extensive use in solid masonry structures and in suspended tile construction in the petroleum and petrochemical industry.

Insulating brick. — Insulating brick are similar in nature to insulating firebrick except that they are used for backup insulation instead of in direct contact with the flame. They may be made from fire clay (as are insulating firebrick), or may be made from other insulating materials such as diatomaceous earth, vermiculite, etc.

TABLE 1—PROPERTIES OF REFRACTORY BRICK AND TILE (HIGH DUTY)

	Dry press	Stiff mud
Pyrometric cone equivalent A.S.T.M. C24-46	32-33	32-33
Temperature equivalent, °F.	3,090-3,175	3,090-3,175
Reheat A.S.T.M. C113-46, Per cent contraction or expansion at 2,550° F.	0-0.5 ctr.	0-0.5 ctr.
Hot load test A.S.T.M. C16-41, Per cent deformation—High heat duty, 2,460° F.	2- 4	2- 4
Panel spalling test A.S.T.M. C107-47, per cent loss—High duty 2,910° F.	2- 6	6-10
Apparent porosity A.S.T.M. C20-46 (per cent)	15-20	10-13
Water absorption A.S.T.M. C20-46 (per cent)	7.5- 9.5	4.0- 5.5
Modulus of rupture A.S.T.M. C133-39, psi.	700-1,000	1,400-1,800
Cold crushing strength A.S.T.M. C133-39, psi.	1,800-2,500	3,800-4,800

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16 "BS&B IN THE PROCESS INDUSTRIES" is a 20-page, two-color catalog filled with illustrations and descriptive material on special fabrication services, immersed coil, and direct-fired heaters, bolted and welded steel tanks, walkways, and stairways. *Black, Sivalls & Bryson Inc.*

17 INDUSTRIAL EXPANSION JOINTS AND AIRCRAFT BELLOWS. This 40-page catalog contains over 78,000 possible combinations of bellows-type expansion joints, and a complete line of aircraft bellows and assemblies. As a reference handbook it illustrates a diversified line of standard and special bellows assemblies used to take up expansion, contraction, and offset movements in pipes and conduits. *Solar Aircraft Co.*

18 DIAFLOTE, a new development in liquid storage tanks, is fully described in Bulletin 51 DF, which details many of the applications and contributions the Diaflote offers in storing high volatile, high purity, deaerated, corrosive, and inflammable products. *Hammond Iron Works.*

19 TYPE 5-114 RECORDING OSCILLOGRAPH, a multichannel, precision instrument for the anaylsis and measurement of strain, vibration, pressure, and acceleration, is the subject of fully illustrated technical Bulletin CEC-1500B. *Consolidated Engineering Corp.*

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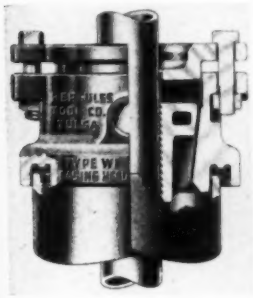
IT'S NEW CHECK IT

by Dan B. Miller

23 WATER FLOODING TUBING AND CASING HEAD was designed especially for water-flooding projects. It can also be used advantageously on other wells and is capable of supporting an inner string of pipe weighing up to 100,000 lb. Because of its special designed features and low initial cost it is also ideal for low pressure wells where it is desired to pack off the well head to prevent surface water or other elements from getting down into the well. A special designed groove extending up into the bottom of the head is equipped with packing which provides a seal between the head and casing. The weight of the inner string of pipe suspended on the slips within the head forces the sealing off between the head and the outside string of casing. The inner string of tubing or casing is supported by slips. The annular space is sealed off by means of a split rubber packing ring resting on top of the slips. A packing gland which is drawn down by two bolts distorts the rubber packing ring into an effective seal. By this means upward movement of the tubing is prevented. The slips are either hinged or dowel pinned together, thus assuring easy installation and perfect alignment. *Hercules Tool Co.*

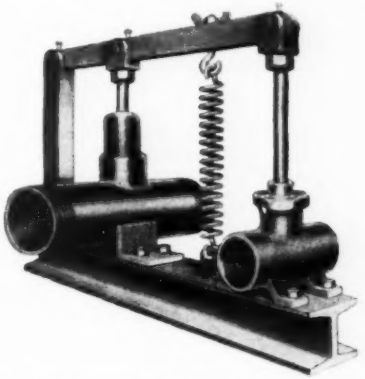


IT'S NEW CHECK IT

24 NEW FIELD FLARE BURNER. Smokeless burning of large volumes of disposal gases along with low steam consumption and high resistance to heat damage are features of a new field flare burner. The new flare is for use in refineries, gasoline plants, chemical plants, and other facilities where excessive volumes of gases must be burned as a means of disposal. Made of heat resisting alloys and employing a new method for cooling of the burner parts in combination with completely stable piloting in winds up to 80 m.p.h. this new flare burner has attracted widespread attention throughout the industries. *John Zink Co.*

IT'S NEW CHECK IT

25 A-1 GARDNER WATER-CONTROL VALVE is designed to cut off the water to the mud tank or mud pit whenever the mud pressure drops off, as in coring or making connections. The water line to the tank or pit and the mud line from the tank or pit are connected in



parallel. Mud pressure acting on a piston overcomes counter-acting spring tension, keeping the mud line and water line open while the pressure is up. Whenever the pressure drops off, spring tension automatically closes both the mud line and the water line. This prevents watering costly mud, saves valuable water, and eliminates the human element of forgetfulness. *A-1 Bit & Tool Co.*

IT'S NEW CHECK IT

26 NEW 3,000-WATT DIESEL ELECTRIC PLANT is powered by an air-cooled full-diesel engine. Push-

The Oil and Gas Equipment Digest presents a review of what is new in equipment and trade literature . . . makes it possible for readers to obtain full information on every subject by use of convenient "Check It—Mail It" service card. This periodic feature of The Oil and Gas Journal will include all that is new in equipment . . . at a time when new products are being introduced, and existing products improved.

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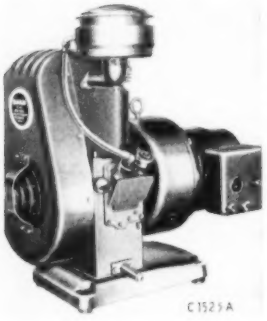
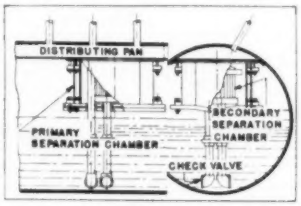


switch control for electric cranking, manual compression release and an electrically heated glow-plug for cold-weather starting are provided. The plant is driven by an improved four-cycle single-cylinder Onan DSP diesel engine which incorporates many new engineering features. Exceptional operating economy has been achieved; approximately 0.155 gal. of low-cost furnace oil is consumed per kilowatt hour at full rated load. The compact and easily installed plant generates 115-volt, 60-cycle, single-phase current. Other a.c. models available in single phase produce 230 volts and 115/230 volts. *D. W. Onan & Sons, Inc.*

IT'S NEW — CHECK IT

27 DRY SCRUBBER PURIFIER with two-stage separation designed for use where extremely high quality vapor is required, capable of delivering vapor containing 1.0 PPM total solids or less, provides internal upflow operation in pressure vessels. In addition it eliminates need for auxiliary baffles within the drum. Primary stage separation is accomplished by means of a rectangular-shaped antiturbulence shield, effectively blocking direct contact of turbulent liquids and spray with the secondary separation chamber behind the shield. Secondary separation is accomplished by means of either upflow or downflow purifiers enclosed within the antiturbulence shield. The purifier employs properly applied centrifugal and centripetal forces to achieve separation efficiencies of 99.9 per cent or better to provide delivery of clean, dry vapor at all times. *Centrifix Corp.*



IT'S NEW — CHECK IT

28 FLEX-TIP RING JOINT GASKET. Will be manufactured in all sizes used in well control for pressure of 2,000 psi. and above. Design embodies two independently acting seals. The first sealing mechanism is the standard A.P.I. metal-to-metal seal. Two additional features are the resilient Flex-Tip and the inner and outer beads which offer substantial protection against mechanical damage to the smooth steel seating surfaces. The beads also protect the ring against corrosion. The Flex-Tip mechanism uses the interference principle of sealing

A new compound has been employed to give resistance to chemical reagents commonly found in connection with drilling for or producing petroleum. The effectiveness of the second seal is independent of the initial tension of the bolting. With bolting made up slightly more than finger tight, test pressure can be held indefinitely without damage to flange, ring, or bolting. The ability to seal is not destroyed easily by foreign material trapped in a ring groove, or by poor surface finish. *Petroleum Mechanical Development Co.*

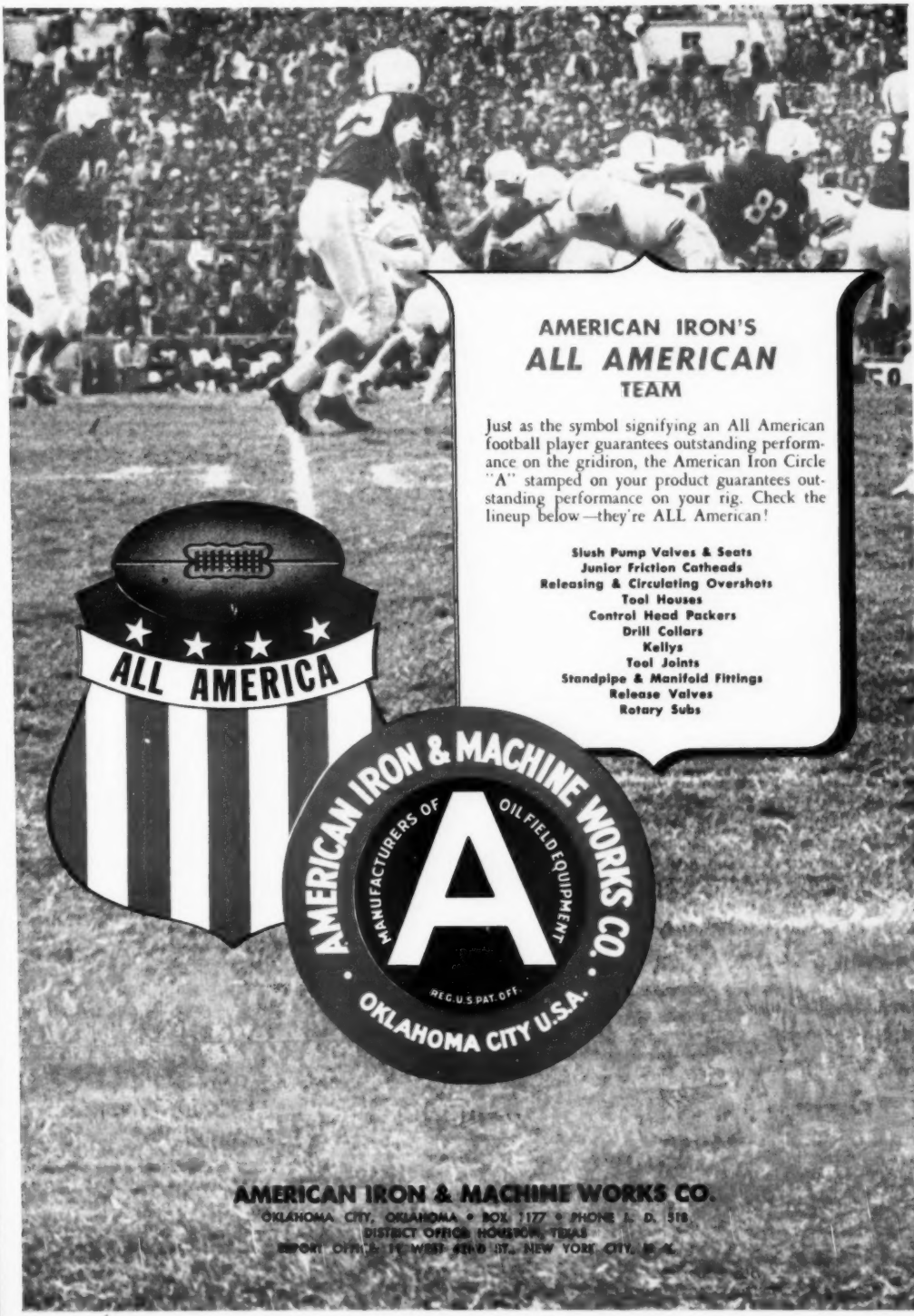
IT'S NEW — CHECK IT

29 WALKER CENTRIFUGE. A unique, compact centrifuge machine has been developed for accurate measurement of b.s. and water content. It features a combined rheostat and switch with safety pilot light. Speeds are adjustable up to 2,450 r.p.m. Six volts and five and one-half amps make it easy on the car battery. Easy to install in the gager's car, the centrifuge now occupies less space. All-aluminum construction makes it lighter and of nonsparking material. The tube head is numbered to aid ready identification of samples. A direct drive to the tube head eliminates unnecessary bearings. The control panel is simple to use and easy to see. *W. L. Walker Co.*

IT'S NEW — CHECK IT

30 PORTABLE DRY CHEMICAL FIRE EXTINGUISHER. A combination of stainless steel and aluminum in construction assures minimum weight without the sacrifice of necessary strength and durability. The 20-lb. size weighs only 14 lb. 12 oz. empty, and the 30-lb. size, 17 lb. 8 oz. Fully charged and ready for use, they weigh only 37 lb. 2 oz. and 50 lb. 14 oz., respectively. These units are all tested to 500-lb. pressure, and in many tests have gone as high as 1,250 lb. before rupturing. Ample pressure is provided by CO^2 pressure cartridges. Operating pressures range from about 150 lb. initially, to about 50 lb. at the finish. Finger-tip nozzle control provides quick, easily controlled blasts of powder when needed, and assures complete shut-off to conserve unused powder. The large filler opening is $2\frac{1}{2}$-in. diameter. Careful engineering in designing size, length, and angles of both the pressure tube and the pick-up tube, in their proper relationship to the tank itself, assures from 95 per cent to complete discharge of contents. *Fyr-Fyter Co.*

IT'S NEW — CHECK IT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Releasing & Circulating Overshots
Tool Houses
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Kellys
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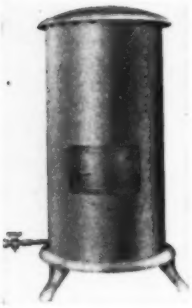
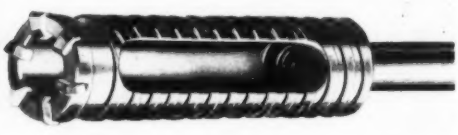
OIL AND GAS EQUIPMENT Digest — IT'S NEW — CHECK IT



31 LITTLE DEMON HEATERS supply abundant heat at lowest possible cost. The heater burns any kind of gas and can be installed quickly and easily. These heaters can be used without vents if desired. Oil companies, field offices, supply houses, warehouses, and machine shops will find them invaluable. It has twin-burner heads which create intense heat and a baffle system which tends to eliminate all fumes and avoid fuel waste. *Ewing Manufacturing Co.*

IT'S NEW — CHECK IT

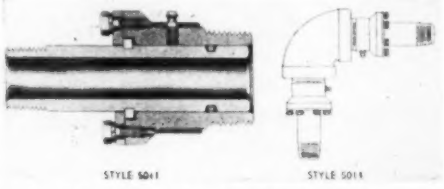
32 CARBIDE TIPPED MASONRY DRILL makes it possible to drill large holes in concrete, brick, or other masonry materials for pipe or conduit. A new drill stocked to 4-in. diameters and manufactured to



10-in. diameters on special orders. Cuts only a ring in the concrete and the core formed in the drill is removed by means of the core-exhaust slot. It will cut rods or beams when embedded in concrete and is used with an ordinary electric-drill motor in the small sizes or with rotary-air or gasoline-powered motors in the large sizes. The screw in extension shanks make it possible to drill through any thickness of wall or to as much as 15 ft. deep. Smaller diameters have drilled up to 6 in. per minute. A resharpening service is maintained to give the user the longest possible use of the drills. *Tilden Tool Manufacturing Co.*

IT'S NEW — CHECK IT

33 NEW LINE OF SWING JOINTS is particularly applicable to gasoline and oil-tank car or truck loading and unloading lines. It provides for 360° rotation around



the axis of the joint with a long bearing surface to support the weight of normal piping. When used in pairs, connected by 90° ell, they provide for up-and-down and side-to-side action. Easy arrangement for counter-balancing of supported piping is also provided. Sizes available range from ⅜ to 3-in. for threaded connections and from 4 to 12-in. with flanged connections. A total of 60 different models are available. Sealing is by means of an "O" ring confined in a recess in the sleeve of the joint. Special "O" rings are provided for handling gasoline, fuel oil, and other liquids without softening, swelling, or deterioration at any pressure from 0 to 100 psi or to as high as 500 psi. in the smaller sizes. This material is also suitable for temperatures from —40° to 225° F. *Barco Manufacturing Co.*

IT'S NEW — CHECK IT

34 TIME-SAVING BUCKET TOOTH. Tap-In bucket teeth are now standard equipment on all Trenchliners. Principal feature of the newly designed, self-locking tooth is the "easy-in, easy-out" time-saving replacement involved. Tap-In teeth eliminate the need for bolting or crimping edges to hold teeth in position. A precision-fit taper locks the tooth firmly in place either on buckets or sidecutter bars. Sturdy tooth holders are integrally cast with the bucket lip for positive tooth support. By welding adapters to the buckets, Trenchliners of any age can be converted to use Tap-In teeth. Tap-In teeth are designed with added clearance for maximum wear before replacement becomes necessary. In addition, Tap-In teeth need not be reversed. The tooth is designed to retain a sharp point by constant use until worn down to clearance. *Parsons Co.*

IT'S NEW — CHECK IT

35 IMPROVED CLAUS PROCESS for recovery of elemental sulfur from hydrogen sulfide can be used with gases having more than 10 per cent H_2S by volume. Special regulating organs behind the waste heat boiler, which in turn is an integral part of the combustion furnace, enabling a better regulation of temperature in the catalytic converters. This improved process results in a yield of 95 per cent sulfur with an electric energy consumption of 50 kw.-hr. per ton of sulfur produced. *General Industrial Development Corp.*

IT'S NEW — CHECK IT

36 MAISCH LINE OF SMALL METERING PUMPS are of fixed and variable capacity for dispensing controlled volumes of hot or cold, viscous, or nonviscous liquids with smooth, nonpulsating flow. Maisch metering pumps are precision built; floating stainless-steel gears permit close running tolerances within a self-lubricating carbon housing. Pump heads are quickly demountable and sterilizable. Governor-controlled units provide full power at all speeds from 10 to 75 r.p.m. Variable-speed transmission units are adjustable in capacities from 0 to 50 ml. per second. Liquid is dispensed as soon as motor starts; a check valve prevents dripping when motor stops. Maximum head pressure is 15 psi. *Mechanical Products Corp.*

IT'S NEW — CHECK IT

NATURAL GAS

PAD Names Experts to Forecast Gas Needs, Supply

WASHINGTON.—Twelve natural-gas industry experts have been retained by the Petroleum Administration to advise and assist in the forecasting of gas supply and requirements.

No comprehensive forecasting program for industry expansion has ever previously been attempted by any governmental agency or industry group, and PAD considered it advisable to call upon trained men selected from all major gas market areas of the country to map on a continuing basis the probable course of development and the materials needed for that development.

Members of the group, all engineers or executives, and all of whom will serve without compensation, are:

Potice C. Avant, Atlanta Gas Light Co., Atlanta; Roy M. Bauer, Southern California Gas Co., San Marino, Calif.; Robert D. Brunet, Columbia System Service Corp., New York; Gordon C. Griswold, Brooklyn Union Gas Co., Westfield, N. J.; Hall M. Henry, New England Gas & Electric Association, Cambridge, Mass.

Dewey B. Larson, Portland Gas & Coke Co., Portland, Ore.; Preston Parks, Colorado Interstate Gas Co., Colorado Springs, Colo.; L. T. Potter, Lone Star Gas Co., Dallas, W. Lawrence Shomaker, Northern Natural Gas Co., Omaha; T. J. Strickler, Gas Service Co., Kansas City, Mo.; Henry Tuttle, Michigan Consolidated Gas Co., Detroit; and Otto E. Zwanzig, American Gas Association, New York.

33-Mile Gas Line Gets Temporary FPC Approval

WASHINGTON.—A temporary certificate authorizing the construction and operation of a 33-mile natural-gas pipe line in Illinois has been granted to Union Gas & Electric Co., of Bloomington, Ill., by the Federal Power Commission.

The 8-in. line which will be used to furnish retail natural-gas service to Bloomington, Normal, Farmer City, Le Roy, Downs, and adjacent rural areas, all in Illinois, will extend from a point of connection with facilities of Texas Illinois Natural Gas Pipe Line Co. in Piatt County, Illinois, to a connection with Union's existing plant in Bloomington.

Estimated total capital cost of the proposed line and related facilities is approximately $892,136. Union also expects to spend about $133,214 to convert the appliances of its customers for natural-gas use.

Capacity Increase Sought

WASHINGTON.—Kansas-Nebraska Natural Gas Co., Inc., is seeking authority to increase the capacity of its natural-gas-transmission system from the presently authorized 164,200,000 cu. ft. per day to 182,600,000 cu. ft. daily. The hearing will commence on October 15 here by the Federal Power Commission.

The proposed project which is estimated to cost approximately $976,330, would serve new markets in Nebraska and Colorado, and provide additional gas for the increased demands of the firm's existing markets.

Northeastern's Rates O.K.'d

WASHINGTON.—A new natural-gas tariff filed by Northeastern Gas Transmission Co., of Springfield, Mass., providing for an average rate of approximately 46 cents per thousand cubic feet for sales to be made in New England, has been accepted by the Federal Power Commission.

The commission's order, issued last November authorizing the Northeastern project, was conditioned to require the company to file a natural-gas tariff satisfactory to the commission.

The filing of satisfactory rates now permits immediate commencement of deliveries of natural gas by Northeastern to those distributor companies in New England which are prepared to receive it.

Mississippi River Fuel's Storage Program Gets O.K.

WASHINGTON.—The Federal Power Commission has authorized Mississippi River Fuel Corp., St. Louis, to construct and operate underground natural-gas-storage facilities in the depleted Waterloo oil field of Monroe County, Illinois.

The company is currently rushing to completion a gathering system and outlet for Woodlawn gas field. Mississippi River Fuel expects to have all the proposed storage facilities at Waterloo completed by December with exception of a 24-in. pipe line and dehydration plant to remove liquids remaining in the gas.

El Paso Rate-Increase Proposals to Be Heard

WASHINGTON.—Hearings have been scheduled for October 15 and 17 here by the Federal Power Commission in the proceedings involving two separate natural-gas rate-increase proposals by El Paso Natural Gas Co., which together amount to approximately $9,565,000 per year.

The October 15 hearing will be concerned with the $2,465,000 increase which was suspended by the FPC in April of 1950, but went into effect under bond on October 1, 1950. It affects El Paso's wholesale natural-gas service to Southern California Gas Co. and Southern Counties Gas Co. of California, both of Los Angeles.

The October 17 hearing will involve the other rate increase proposal which amounts to about $7,100,000 per year and would affect 26 of El Paso's utility customers in Arizona, California, New Mexico, and Texas. The commission suspended this increase in May 1951.

Natural Gasoline

Snyder Gasoline Plant to Be Dedicated on October 24

SNYDER, Tex.—The Snyder gasoline plant, operated by Sunray Oil Corp., for 30 companies and 60 individuals owning leases in Kelly-Snyder field, will be officially dedicated October 24.

The completed plant, which was begun in July 1950 and cost $8,000,000, went on stream for production of gasoline and liquefied petroleum gas products in June. It extracts casinghead gasoline and other byproducts from the natural gas of a large portion of Kelly-Snyder canyon reef field in Scurry County.

Initial design processing capacity of 70,000,000 cu. ft. of gas daily anticipates a recovery of more than 547,000 gal. of liquid products daily. *(See The Oil and Gas Journal, April 19, 1951, page 174, for engineering data on the Snyder plant.)*

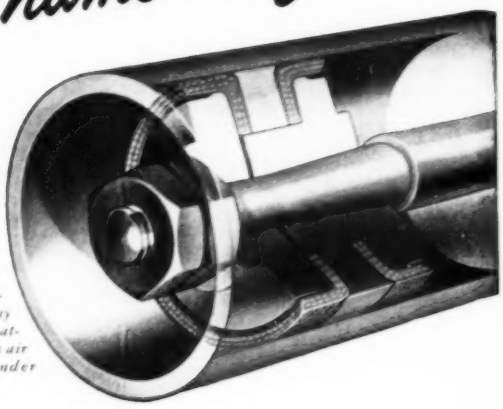
N.G.A.A. Meeting Set

The program of the Southern regional meeting of the Natural Gasoline Association of America, scheduled in Tyler, Tex., October 19, will feature an "operating kinks" session, according to program chairman, E. L. Berry, Gregg-Tex Gasoline Co., president of East Texas Natural Gasoline Men's Club.

The club is cosponsoring the meeting with N.G.A.A. and its members have stimulated a large number of entries in the session in which operating men compete with their own original ideas for doing any job in a better, safer, or cheaper way.

Prize winners will be entered automatically in the Mid-Continent contest at N.G.A.A. annual convention in Houston next spring and will compete against winners in similar contests to be held at N.G.A.A. regional meetings in Amarillo in November, and Odessa, Tex., in February.

You name the fluid...



Phantom cutaway showing typical Pumcup-piston assembly—one of many types for all reciprocating pumps as well as air or hydraulic cylinder mechanisms

Here's how to pump it at lower cost!

IN thousands of plants, Darcova Pumcups are solving the problem of diminishing pump efficiency, repacking, maintenance, down-time, lost production—the things that really eat up dollars in fluid-handling operations!
Here's why . . .

1. Darcova composition Pumcups not only increase volumetric efficiency, but they *keep* it high with no appreciable fluid slippage for the entire life of the Pumcups.

2. And, because of their design, composition, and operating principle, Pumcups have *many times the life* of most other types of piston packing.

3. Based on years of application research, Pumcups come in standard and special compositions for exceptional stability in handling almost *any* fluid you can name. For example . . . strong acids and alkalies, food products and even the most troublesome petroleum derivatives.

Big savings? We'll gladly refer you to Pumcup users whose problems are similar to yours. *They'll* tell you! Meanwhile, send for a free bulletin containing helpful, more detailed information: Bulletin 4401 on Pumcups for reciprocating pumps; Bulletin 4502 on Pumcups for air and hydraulic mechanisms. Just write to . . .

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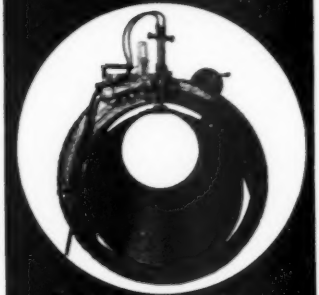
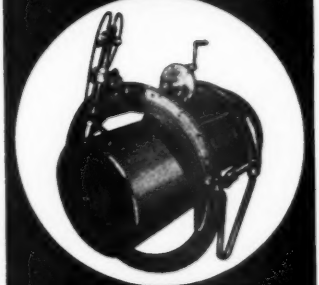


EQUIPPED WITH OUT-OF-ROUND ATTACHMENT

Machines to cut and bevel 18" pipe and over are furnished with out-of-round attachment.



EQUIPPED WITH STANDARD TORCH HOLDER

Machines to cut and bevel 14" pipe and under are furnished with Standard Torch Holder.

Crose pipe cutting and beveling machines are sturdy light weight construction made from cast aluminum. Simple operation. This machine has a split ring which enables it to be installed over the pipe for cut outs. The out-of-round cutting attachment allows you to cut true bevels on bent or egged pipe. Machines to cut and bevel pipe up to and including 36 inches in diameter are available for immediate delivery.

WRITE FOR BULLETIN BM1001

M. J.
CROSE
MANUFACTURING CO., INC.
2715 Dawson Rd. Tulsa, Okla.
M & M Building Houston, Tex.

PIPE LINES

Trunkline Features

Many innovations used in laying natural-gas line

LINE and station design of Trunkline Gas Co.'s 1,300-mile system incorporates several innovations along with established practices.

Trunkline's construction of the pipe-line transmission from McAllen, Tex., to Tuscola, Ill., started on May 4, 1950. The initial delivery capacity of the line is 250,000,000 cu. ft., all of which will be delivered to Panhandle Eastern Pipe Line at its Tuscola, Ill., compressor station, with the exception of a maximum of 1,500,000 cu. ft. of gas per day, which will be delivered to Southeastern Illinois Gas Co. for distribution at Metropolis, Ill.

Actual laying operations of the line were completed on August 9, 1951, and deliveries were started October 1 *(The Oil and Gas Journal, October 4, 1951, page 55)*.

Design of the line and stations follows proved methods and practices that have been utilized by the pipeline industry for years, although several innovations and improvements were incorporated. The line is designed to operate at 900 psi. pressure. The pipe used on the 26-in. section is 26-in. o.d. by 5/16-in. wall, of electric submerged-arc-welded construction, having minimum yield strength of 52,000 psi., and buried in a ditch 56-in. minimum depth.

Corrosive protection.—To protect the line against corrosion, a coal-tar-base enamel was applied on the pipe, to a thickness of 3/32-in. This is reinforced with glass wrap. There is an outside spiral wrap of heavy kraft paper. Each section of line, for a distance of approximately 25 miles out of each compressor station, is wrapped with a 15-lb. tar-impregnated asbestos felt to prevent damage or sagging of the paint in the event of high gas temperatures in these sections.

All valve settings were installed aboveground for easier accessibility. Mobile X-ray units were employed to check all of the more vital welds and as many of the straight-line welds as possible. Approximately 13 per cent of all the line welds were X-rayed; 100 per cent of all river crossing and compressor station welds were X-rayed.

River crossings.—Construction of river crossings represented an innovation, particularly with respect to the weighting of the line in the rivers.

Instead of figuring the normal weight of water in the design of the Trunkline crossings, "85-lb. water" was used for the design. Reinforced-concrete jacket approximately 3 in. thick was placed by guniting over the entire length of the river lines. This method was preferred because it gives equal distribution of the weight, increases the lateral strength of the pipe, protects the coating during installation, and resists any scouring effect which might occur if the line becomes exposed. The lines across all of the major rivers were buried to a minimum of 15 ft. below the bottom of the river.

In the crossing of the Mississippi River, a total of 8,394,000 cu. yd. of material was dredged from the bottom and approaches to the river for the installation of two 24-in. lines. Two 24-in. by ½-in. wall, seamless steel lines, both curved upstream, were laid across all major rivers.

Compressors.—The four initial compressor stations, of 8,000 hp. each, are located at Longville and Epps, La.; Independence, Miss.; and Joppa, Ill. The stations use 2,000-hp. engines. Compressor stations have a "unitized design" in that the main compressor engines supply all of the power with the exception of lighting. The engine jacket water is cooled through radiator-type facilities, the fan for which is driven through shafting from the main engine. The pump, for circulating the water through the coils in the tower, is geared directly to the engine. The lubricating oil for the engines is cooled in a heat exchanger which utilizes the suction gas for cooling purposes. All piping at the compressor stations is carried overhead instead of being buried underground.

Trunkline Gas Co. has purchase contracts with several companies for its supply of gas, reserves of which are estimated to be 2 trillion cubic feet. This gas will come from Grand Lake, Pecan Lake, and Hurricane Creek fields in Louisiana; and Lake Creek, Pinehurst, Altair, Columbus, Ramsay, McAllen, Orange Grove and Wade City fields in Texas.

Route of the line travels through more than 500 miles of gas-producing territory along the Gulf Coast of Louisiana and Texas.

Wyoming Line Starts

POWELL, Wyo.—Construction has started on a 9-mile, 12-in. pipe line from Lovell to Garland, Wyo., by Montana-Dakota Utilities Co. The new line will replace a 4-in. line that previously carried sour gas to Ohio Oil Co.'s refinery and to a nearby sugar company plant. J. W. Albrecht, Bridger, Mont., has contract.

The carrier will bring gas out of

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Use the power of steam, air or water under pressure to lift liquids. Being simple jet pumps they have no moving parts and require no lubrication. A variety of models to meet different conditions. Also used as water heaters.

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the Worland-to-Baker, Mont., line and connect with the present 8-in. line at a desulfurization plant in Garland field near Byron.

W. G. Heltzel Honored

William G. Heltzel, consulting engineer, was honored at the recent Petroleum Mechanical Engineering Conference in Tulsa by advancement to the rank of Fellow in the American Society of Mechanical Engineering in recognition of outstanding attainments and contributions to the engineering profession. Announcement of the honor was made by Francis J. Daasch of Gulf Oil Corp. who represented J. Calvin Brown, president of A.S.M.E.

In recent years Heltzel has been engaged as consultant in pipe line engineering. Much of it has been for projects in foreign countries.

Radio Facilities O.K.'d

WASHINGTON.—Construction permits for 9 base stations, 50 mobile transmitters, and 12 fixed stations in the petroleum radio service have been issued by the Federal Communications Commission for use on pipe-line systems as follows:

Southern Natural Gas Co.: Base station near Opelika, Ala., to operate on 49.06 mc. and a control station near Auburn and a repeater near Opelika, each operating either on 75.70 or 72.70 mc.

Service Pipe Line Co.: Three base stations near Woodson and Ranger and at Albany, Tex., respectively, and 30 additional mobile units in northern and western Texas and southeastern New Mexico, on 49.14 mc.

Panhandle Eastern Pipe Line Co.: Base station at Muncie, Ind., to operate on 48.70 mc.

Trunkline Gas Co.: Two base stations on 49.02 mc. near Victoria and Rosenburg, Tex., and three control stations on 1880, 1930, and 1980 mc. near Edith and Oretta, La., and Liberty, Tex.

Michigan Gas Utilities Is Granted New Line Permit

WASHINGTON—Michigan Gas Utilities Co., Battle Creek, Mich., has been given temporary authorization to construct 77 miles of pipe line in Michigan to carry natural gas to the Sturgis, Hillsdale, and Coldwater area of South Central Michigan.

The project, to cost $1,500,000, will have a daily capacity of 11,000,000 cu. ft. of natural gas. Panhandle Eastern Pipe Line Co., Kansas City, Mo., has been directed to deliver 5,000,000 cu. ft. of gas daily to Michigan Gas.

The project will include 22.7 miles

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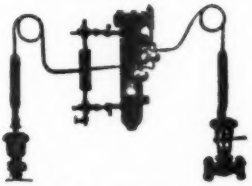

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of extension from a connection with Panhandle's system near Marshall to Coldwater; 20-mile extension east to Hillsdale, and 22.5 miles southwest to Sturgis; a 5-mile line from Hillsdale to Jonesville, and a 6.5-mile line west to Union City.

Private Radio-Telephone Circuit Planned for Line

NEW YORK.—The Federal Communications Commission, Washington, has been asked by the Long Lines department of American Telephone & Telegraph Co. here for authority to provide a private wire and VHF (very high frequency) radio-telephone system along a new oil pipe line between Lumberton, Miss., and Mobile, Ala., operated by Gulf Refining Co.

The pipe line requires eight intermediate heater stations and one intermediate heater and pumping station to move crude oil along the 88-mile route.

Five of the stations will be connected by radio telephone to a base radio transmitter and receiver at Wiggins, Miss. The other four will be connected to a similar base station just outside of Mobile. These base stations, in turn, will be joined to each other and to the pipe-line terminals at Lumberton and Mobile by existing wire-line facilities.

Texas Eastern Buys Building

SHREVEPORT.—Texas Eastern Transmission Co. has purchased a 14-story apartment house, now under construction, for use as an office building. The transaction between Texas Eastern and Shelby Construction Co., New Orleans, is believed to have been for a consideration of between $4,500,000 to $5,000,000.

Under terms of the sale agreement, title to the recently remodeled Texas Eastern building will be transferred to Shelby, according to R. H. Hargrove, Texas Eastern president.

Service Seeks to Build Extension in Wyoming

CHEYENNE, Wyo.—Service Pipe Line Co. has asked the Wyoming Public Service Commission for permission to build a $714,000 extension to its present crude-oil pipe-line system.

The 22.8-mile line would extend from the company's line in South Cole Creek oil field in Converse County northwest to Sage Spring Creek and North Sage Spring Creek fields in Natrona County.

The extension would link present gathering systems in those fields and provide a means of transporting crude from those fields to refineries in Wyoming and other states.

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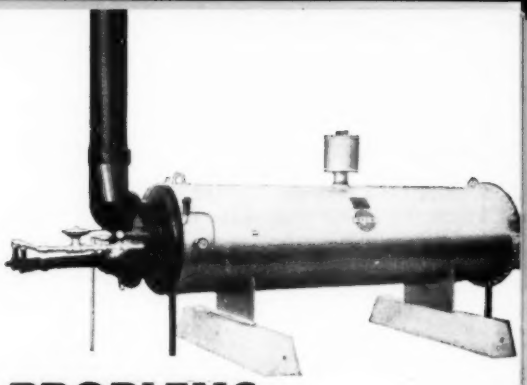

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REFINING

Esso to Expand Plant

Baton Rouge capacity to be 270,000 bbl. daily

BATON ROUGE, La.—The new $35,000,000 construction program announced last week by Esso Standard Oil Co. for its refinery here *(The Oil and Gas Journal, October 4, 1951, page 158)* is the plant's second major postwar expansion program. The latest plans call for stepping up capacity from 240,000 to 270,000 bbl. daily.

The refinery has been growing steadily since World War II, and when the new project is completed, its capacity will be twice its wartime throughput of 135,000 bbl. Refinery workers number more than 8,000, and the pay roll now runs around $38,000,000 per year.

The Baton Rouge refinery is now operating at top capacity, according to H. J. Voorhies, general manager, and the newly announced expansion program is planned to meet the nation's defense needs and the increased requirements of petroleum products for civilian and industrial consumption.

New facilities.—Construction of the new facilities will begin immediately, Voorhies said, and will be completed in 2 years. They will include new distillation equipment for crude oil and other petroleum fractions; expansion of fluid catalytic cracking facilities; additional equipment for processing petroleum gases to provide some of the raw materials for chemicals and materials for aviation gasoline; expanded blending and shipping facilities for gasoline, kerosine, and heating oils; facilities for producing additional butadiene for synthetic rubber; new facilities for stepping up the plant's output of synthetic alcohols from petroleum; and equipment for production of benzene.

Additional crude oil to be processed when the expansion program is completed, Voorhies reported, will be available for delivery to the refinery through the large pipe-line systems already serving the plant.

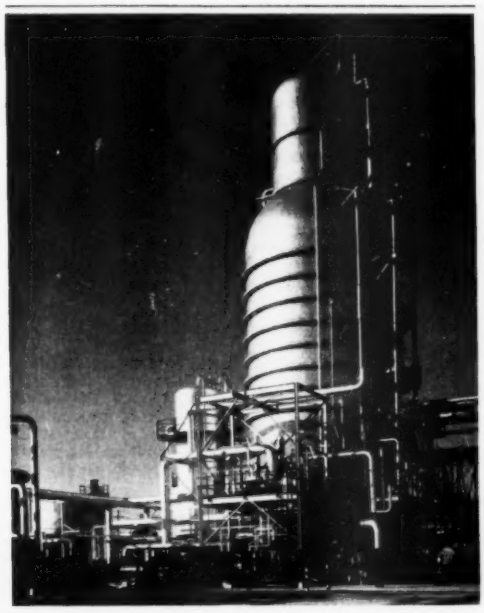
"The company's decision to spend the money for this expansion at Baton Rouge," he said, "reflects our faith in the industrial future of this country and the State of Louisiana."

Standard of Texas' Plant Facilities to Be Enlarged

EL PASO.—A contract has been awarded to M. W. Kellogg Co. by Standard Oil Co. of Texas for enlarging facilities of the latter firm's refinery here.

Plans call for installation of a reduced crude vacuum unit, a Houdriflow catalytic cracking unit, synthetic distillation, gas plant and treating units, an alkylation unit, and new storage tanks.

The refinery will produce 1,400 bbl. of high-octane gasoline daily when the new facilities



***WORLD'S LARGEST.**—The world's largest residuum stripper, rated at 50,000 bbl. of charging stock daily, recently was placed on stream at Richmond refinery of Standard Oil Co. of California. Built to reduce the plant's yield of heavy residual fuels, it will take heavy oils from other refinery processes and strip them to prepare feed stock for a 32,500-bbl. cat cracker now undergoing conversion.*

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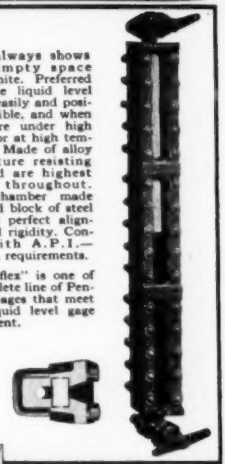

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are completed and in operation next June.

Strict Pricing Might Affect New Petrochemical Plants

WASHINGTON. — Representatives of the petrochemicals manufacturers have warned the Office of Price Stabilization that the application of unduly strict pricing procedures would force the industry to abandon many plans for plant expansion sought in the interest of the defense program.

Such a situation, it was brought out at a meeting of the petrochemicals industry advisory committee at its first meeting with OPS officials, might result from application to the industry of Ceiling Price Regulation 22. That regulation calls for a base period of July 1, 1949-July 24, 1950, a period when the industry was depressed and the resultant ceiling prices would cause rollbacks for many manufacturers.

The committee pointed out that calculation of ceilings under CPR 22 is difficult on many counts and recommended that the industry continue to have the option of pricing under either that regulation or the General Ceiling Price Regulation.

Application of the GCPR would be satisfactory for the present, the OPS was told, although it is questionable whether such prices would be adequate to cover increases in freight and labor costs in the future.

One of the problems faced by OPS in attempting to develop a tailored regulation for the industry is that of defining precisely the products to be included, it was brought out.

IRB Reports Taxes From Petroleum Up $13,000,000

WASHINGTON.—August collections from the three oil taxes totaled more than $77,000,000 and were almost $13,000,000 above the same month last year, it was announced this week by the Internal Revenue Bureau.

Nearly all of the increase was in the tax on gasoline, which rose to $64,817,597 from $52 018,883. Receipts from lubricating oil showed a slight decline to $9,730,076 from $0,971,709, but revenue from pipe-line transportation increased nearly $400,000, to $2 498,060 from $2,105,304.

For the first 8 months of the year, 1951 collections ran more than $40,000,000 ahead of 1950. Receipts included $384,816,115 from gasoline against $353,226.430 last year; $60,152,416 from lubricating oil against $55,149,004; and $17,218.187 from pipeline transportation against $13,330,681

Davison Chemical Contracts To Make Butadiene Catalyst

BALTIMORE. — Davison Chemical Corp. has contracted with the Reconstruction Finance Corp. Office of Rubber Reserve to produce a tantala-silica gel catalyst for deriving butadiene from ethyl alcohol and acetaldehyde.

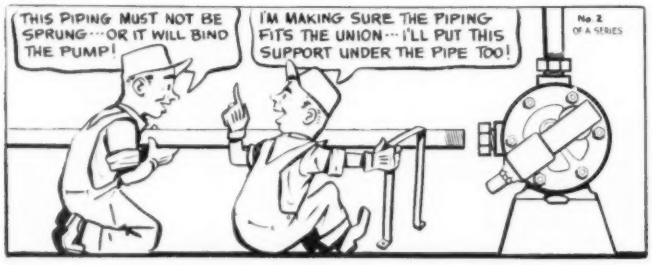
The catalyst will be delivered to Koppers Co. and Carbide & Carbon Chemicals Co., producers of butadiene as agents for RFC.

The catalyst is 2 per cent tantalum pentoxide and 98 per cent silicia gel. The gel is used for the condensation of acetaldehyde to crotonaldehyde. Crotonaldehyde is an intermediate product which is reduced to butadiene by the tantala in the catalyst, with ethanol acting as a hydrogen donor.

Refining Dividends Running 19 Per Cent Higher in 1951

WASHINGTON. — Cash dividends paid by oil-refining corporations during the first 7 months of this year totaled $403 200.000, close to 10 per cent of the dividends paid by all the nation's corporations.

The 1951 payments represented an increase of nearly $65.000,000 over the $339.700,000 reported for the same period last year, it is disclosed by figures compiled by the Department of Commerce.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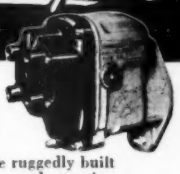

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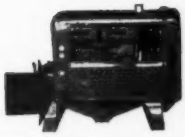

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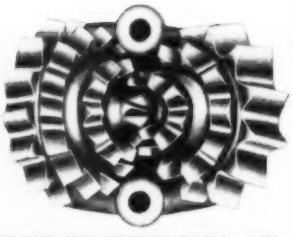

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New Drilling Company Opens Midland Office

The newly organized Clark Dale Drilling Co., Inc., Dallas, is establishing operating headquarters at Midland, Tex., to serve the Permian basin district of West Texas and New Mexico. Operations in this district will be under the direct supervision of J. M. Clark and Dale M. Thomson, vice presidents of the new company, who will be located in the Midland office.

J. M. CLARK

D. M. THOMSON

Clark, who, before becoming associated with the new company, was general superintendent of drilling for the Chicago Corp. at Corpus Christi, will be in charge of the company's drilling equipment. He has been actively engaged in drilling and production operations for more than 25 years, working for various drilling contractors and producers from the Rocky Mountain region to the Gulf Coast.

Thomson, before joining the new company, was district sales manager for the Western Co. with headquarters at Midland, where he has lived for the past 2 years. Previously, he had been associated with drilling companies in Oklahoma. He has had more than 23 years experience in the drilling and well-servicing business.

Main offices of the new drilling company will remain at Dallas, where Charles E. Dimit, president; Creston Alexander, another vice president; and A. M. Early, secretary-treasurer, are located.

O'Rourke-Baker Drilling Co., Tulsa, is drilling for Deep Rock Oil Corp. at 1 Lamunyon, a rank wildcat test in the C NE NW 21-28n-24w, 8 miles northwest of Buffalo, Harper County, northwestern Oklahoma.

Art Logan, Wewoka, Okla., has the contract for a Wilcox sand test which An-Son Petroleum Corp. is starting 2½ miles northwest of Carney, Lincoln County, Oklahoma. Location is for 1 Ealey, SW SW NE 19-16n-3e. It is 2 miles from nearest production, the Northeast Carney pool. Hole is projected to 5,100 ft.

Fullerton Drilling Co., Edmonton, is starting a 3,500-ft. test for Heath Development Co., Ltd., and E. C. Johnstone & Co., in the area 14 miles southeast of Wainwright, eastern Alberta Province, Canada. Location is in LSD 11, 20-43-4w4.

Quad Drilling Corp., Shreveport, is starting on a 5,300-ft. contract at a wildcat location in northern Caddo Parish, northwestern Louisiana. The test, 1 Caddo Levee Board, located in the NE SE 4-19n-15w, is being drilled for Houston Oil, Co. Operators will test the Sligo formation.

Dewey Sherwin, Aztec, N. M., is moving a rig to a new wildcat location in Rio Arriba County, New Mexico, for a test to be drilled for Mission Petroleum Co. at 1 Stephenson, C NW NW 22-26n-1e. Hole is projected to the Dakota section but may be carried to the Pennsylvanian if the Dakota is barren.

Young Drilling Co., Ltd., Calgary, is moving a rig from the Leduc area, near Edmonton, to the Kelsey area, in Central Alberta Province, Canada, where it has the contract for a Devonian exploratory test to be drilled for Anglo-Canadian Oil Co., Ltd., and associates at 1 Heather Brae, LSD 12, 11-45-19w4.

Coats Drilling Co. is the contractor on a projected 7,500-ft. wildcat test being started southwest of the Pine Mills townsite in Wood County, eastern Texas. F. R. Jackson and J. M. Deupree are the operators. Location is for 1 Bartlett, in the J. C. Bradford Survey.

Glenn Gillespie & Sons, Cushing, Okla., will drill a 3,600-ft. Prue sand test for Ivy Petroleum Corp. in the West Davenport area, Lincoln, Okla. Location is on the operator's Rittenhouse lease, in the SW SE NW 32-15n-5e.

Pickrell Drilling Co., Inc., Wichita has taken on a wildcat drilling project 11 miles southwest of Weitzell, in western Rush County, Kansas. It will drill for Solar Oil Corp. at 1 Sutton, SE SE SE 27-17-20.

Glasscock Drilling Co., Shreveport, is starting another wildcat operation in the area 4½ miles southeast of the Lake Larto field, Catahoula Parish,

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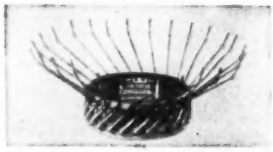

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in the east central part of Louisiana, where it is contracting for Placid Oil Co. The new test, projected to 7,500 ft., is 4 Farrier and associates, in the C NW NE 12-4n-5e.

J. D. Ferrell Drilling Co., Inc., Great Bend, Kans., has a rig working for National Associated Petroleum Co. on a wildcat test in the National area, Cheyenne County, Nebraska. Location is for 1 Walker, SE SE NW 8-13n-52w.

Will I. Lewis, Mt. Vernon, Ill., one of several Illinois basin contractors who recently have moved in on the Rocky Mountain region development, is starting a wildcat test for Carter Oil Co. in the Jack Canyon area, in Carbon County, Utah. The new contract is for 1 Government, C SW NE 13-12s-14e.

Cook Drilling Co., Riverton, Wyo., is the contractor on a projected 4,500-ft. wildcat test which C. H. Murphy, Jr., is starting in the East Popular area, Roosevelt County, Montana. The operation is at 1 Unit, C SW NE 2-28n-51e.

Noble Drilling Co., Tulsa, has moved a rig to a wildcat location east of the Doyle field, Stephens County, Oklahoma, where it is starting a test for The Texas Co. at 1 Pfile, SW SW NW 7-1n-4w.

Lodestar Drilling Co. is drilling an exploratory test in the Skull Lake area, 28 miles southeast of Maple Creek in southwestern Saskatchewan Province, Canada, for a group composed of Delhi Oil Co., Husky Oil & Refining Co., Ltd., and Phillips Petroleum Co.

Webster Drilling Co., Tulsa, has a rig working for Toklan Production Co. and associates on a wildcat location in the West Marlow area, northern Stephens County, Oklahoma. Operation is located in the NE NE SW 20-2n-8w, on Toklan's Price lease. Contract is for 8,000 ft.

ACTIVE ROTARY RIGS*

(United States and Western Canada)

Area	Week ended 10-1-51	Change week ended 9-24-51	Change week ended 10-2-50
Gulf Coast	599	+ 7	+ 71
W. Tex. N. M.	979	— 12	+ 203
Ark.-N. La.-E. Tex.	164	— 2	+ 23
Oklahoma	320	— 9	+ 12
Kansas-S. Neb.	194	+ 5	+ 34
Illinois-Eastern	155	— 4	+ 19
Rocky Mtn.	198	— 6	+ 75
Pacific Coast	180	— 8	+ 35
Total U. S.	2,789	— 29	+ 522
Western Canada	159	+ 14	+ 54
Total	2,948	— 15	+ 576

*Courtesy Hughes Tool Co. Trends in drilling activity in the United States and the Pacific Coast and Illinois-Eastern areas are shown on pages 184 and 185.

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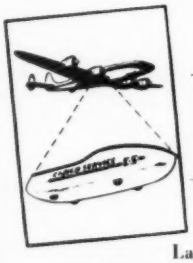

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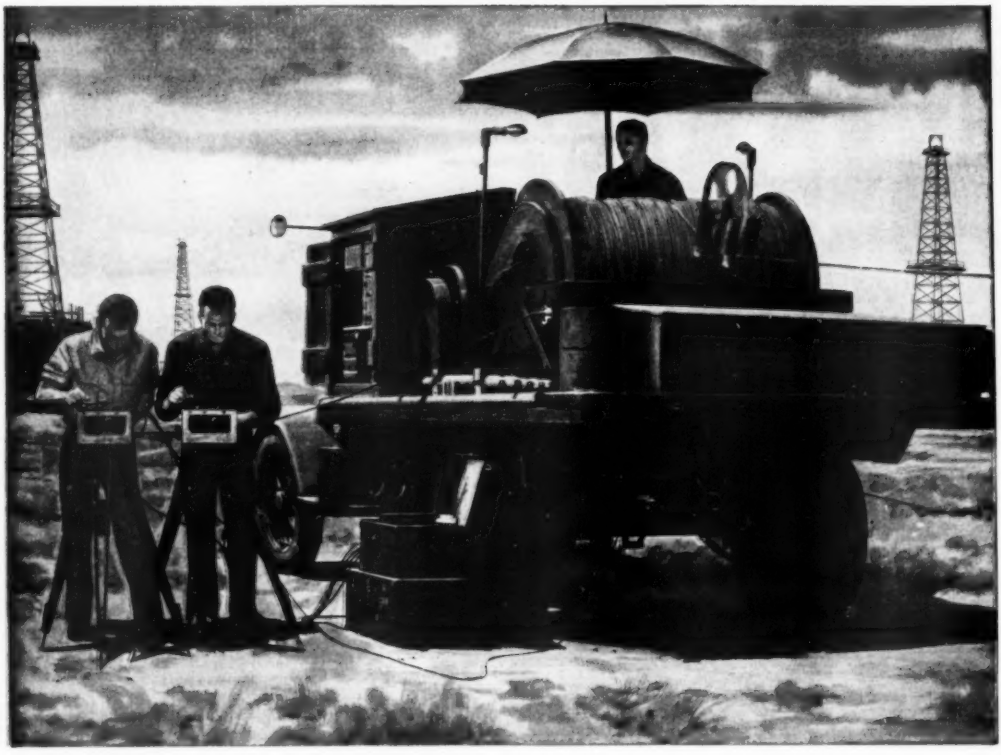

CHAPTER EIGHT in the Facinating Story of the Search for Oil

In 1938 The electrical well logging method, pioneered and developed by Conrad and Marcel Schlumberger as early as 1928, was thoroughly proved and accepted during its first decade of service, and by 1938 "a Schlumberger" had become synonymous with the search for new oil reserves.

"This method, which consists essentially in measuring the electrical resistivity and potential along the walls of a drill hole by introduction of a series of electrodes, not only gives exceedingly important information as to oil, gas and water content of formations penetrated, but also yields a log which, for correlation purposes, is often superior to any other type of log and which in specific cases may be of even greater utility than a complete core section," reported E. De Golyer in a lecture delivered at Princeton University in 1939.

The early electrical logs were plotted by hand, as pictured in this illustration of recording in California in 1932. Present day logs are recorded photographically on film and four or more curves can be recorded simultaneously on the same log.

1951 . . . Since new and improved instruments are still the key to future progress in the endless search for new oil reserves, General maintains extensive instrument laboratories of its own to develop and improve dependable equipment to meet specific needs for various areas. In the hands of capable crews who are qualified by training and experience to accurately compile and interpret seismograph data, General instruments have helped many operators to determine and locate conditions favorable to finding new oil reserves. Let General's crews help you.

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A PRINT OF THIS ILLUSTRATION SUITABLE FOR FRAMING WILL BE SENT ON REQUEST

A Look at Northern Alberta

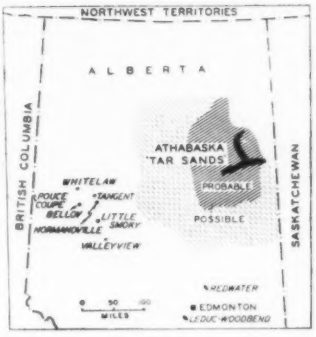
ABOUT 250 miles northwest of the Devonian reef and Lower Cretaceous sand oil fields clustered around Edmonton, Alberta, a limited exploratory drilling campaign has been going on for the past few years with much less attention than the future may prove this initial work merited.

There have been no dramatic discoveries in this area such as at Golden Spike or, more recently, at Wizard Lake; no vast oil reserves uncovered such as at Leduc - Woodbend, Redwater, or Stettler; but the results of the cautious exploratory drilling in this portion of Alberta near Peace River indicate that the area may some day yield some important oil fields.

To date the Peace River area is primarily one of gas. Large gas wells have been completed or indicated in Lower Cretaceous, Triassic, and Permo - Pennsylvanian rocks. The gas wells are at Pouce Coupe, Tangent, Little Smoky, Valleyview, Hamelin Creek (about halfway between Whitelaw and Pouce Coupe), and Bluesky (4½ miles southeast of Whitelaw).

Oil producers in the area have been small by Central Alberta standards. The first was Normandville, completed by Imperial Oil, Ltd., in 1949 for 120 bbl. from about 25 ft. of Upper Devonian biostromal reef at 6,745 ft. The next was Whitelaw, discovered by Shell Oil Co. and British-American Oil Co. in mid-1950, originally completed for 80 bbl. from the Permo-Pennsylvanian at 3,885 ft. The most recent oil discovery was made by Imperial at Belloy. This discovery was completed for 75 bbl. from Permo-Pennsylvanian rocks at 4,120 ft. All three of these discoveries indicated gas in younger rocks and the Belloy tested gas in the Mississippian near the eastern pinchout of these older rocks.

The wells drilled in this area have shown a rapid thinning of the Mesozoic section to the east. Triassic and Jurassic rocks, 2,000 and 500 ft. thick, respectively, near the British Columbia line have wedged out completely within 100 miles to the east. The Lower Cretaceous sediments thin from 4,000 ft. in the foothills to 1,000 ft. at the eastern edge of the Peace River area. In view of the porosity



indicated in the widely spaced Mesozoic discovery wells, this eastward thinning and pinching out is considered highly significant for future prospecting.

Unlike the developments to the west, a great deal has been said about the Athabaska "tar sands." The black inverted T on the map indicates the area of outcrops of these oil sands which run for more than 100 miles along the Athabaska River and its tributary streams. The probable and possible areas of saturation in Alberta are roughly located.

These sands are basal Cretaceous-McMurray which lie on base-levelled Devonian rocks. They are believed to be a delta deposit formed in the invading Cretaceous sea at the edge of the pre-Cambrian shield. They are now covered by sediments up to nearly 2,000 ft. thick in places.

Estimates of the volume of high-quality oil that these sands contain range between 100 and 250 billion (not million) barrels.

The operation of producing this oil must not be considered as similar to getting oil out of shale, but rather should be looked upon as getting sand out of the oil for the sand grains are actually surrounded by oil too viscous to produce conventionally.

As the result of the recent technical meeting sponsored by the Alberta government for the purpose of stimulating interest in the development of this largest known deposit of hydrocarbons, the Athabaska tar sands are back in the limelight. Pilot plants have indicated that the oil can be produced, perhaps in competition with the flush western Canada oil fields.

To produce this known "oil field" is a fascinating challenge, and it does not appear unlikely that some organization, perhaps a team of companies, will move in on this in many ways tempting prospect not too far in the future. *Philip C. Ingalls.*

HIGHLIGHTS OF WEEK'S DEVELOPMENTS

WEST TEXAS.—Spartan Drilling 1-A Scharbauer completed as a 1½-mile east extension to Parks Pennsylvanian field. Potential was 152.6 bbl. of high-gravity oil. Northwest of Pegasus, Sinclair 2 June Tippett completed for 262 bbl. of oil a day from the Pennsylvanian at 10,755-90 ft. Continental and Humble 1-E Powell, in shallow World field of north Crockett County, completed as a Strawn opener for 287 bbl. of 40°-gravity oil from pay at 8,088-8,112 ft.

SOUTHWEST TEXAS.—In rank wildcat territory known as the "Hill Country," unconfirmed reports indicate that a new oil strike is almost assured at Mikton Oil Co. 1 W. F. Stelzer, ½ mile west of Vanderpool in Bandera County. If completed commercially from the Pennsylvanian it will undoubtedly set off a spirited play in this highly speculative area. (See location map under Southwest Texas fields.)

ROCKY MOUNTAIN AREA.—Sinclair Oil & Gas Co. tested oil in the first Wall Creek at the East Teapot, Wyoming, wildcat. Shell Oil Co. recovered 370 ft. of 30°-gravity oil in 55 minutes on test at 8,924-75 ft. at the Pine Unit, Montana, wildcat, for the fourth exploration to report oil in the Williston Basin. Seaboard Oil Co. found additional oil in the Morrison at the Whistle Creek, Wyoming, wildcat.

North Central Texas

Another Gas-Distillate Area Found in Wise County

WICHITA FALLS.—Southern Wise County gained another Ellenburger distillate field at Signal Oil & Gas Co. 1 J. B. Burns, Banks Survey, 1½ mile south of Cottondale conglomerate field and 3½ miles northeast of Daly Ellenburger field. All of the areas are gas-distillate pools.

The new well gaged 13,000,000 cu. ft. of gas a day, plus 45 bbl. of distillate per 1,000,000 cu. ft. of gas. Production was from open hole at 6,912-7,000 ft., plugged back total depth. Flowing pressure on tubing was 2,450 psi.

Four miles northeast of Farmer, Champlin Refining Co. 1 D. D. Strange reported discovery production at 3,564-72 ft. A completion test gaged 146 bbl. of 42°-gravity oil a day through ¼-in. choke.

In Montague County, 6 miles northeast of Montague, Engle Petroleum Co. 1 Frank Collier, Joseph M. Collier Survey, developed 3,690 ft. of oil and 1,350 ft. of salt water on a 95-minute drill-stem test in conglomerate. Oil had reached the surface in 40 minutes. A second test from 6,460-74 ft. recovered over 5,000 ft. of free oil, and also carried salt water on the bottom. Flowing pressure ranged from 750-2,350 psi. Additional shows were logged from 6,514-22 ft. and at last report a test of that section was under way.

O. E. Hall 1 J. P. Ligon, 6 miles north of Saint Jo in the D. D. Baker Survey, prepared to complete following two successful drill-stem tests. At 3,106-10 ft., recovery in 75 minutes was 265 ft. of oil. The second test at 3,107-14 ft. developed flowing oil at the rate of 14 bbl. hourly. Flowing pressure was 410 psi.

The Texas Co. 1 C. W. Heard, Viola lime prospect just east of Bowie, pumped 68 bbl. of oil and 29 bbl. of water in 22 hours from open hole at 7,185-7,207 ft., following a 1,000-gal. acid treatment.

NORTH CENTRAL TEXAS (DISTRICTS 9 AND 7-B) SUCCESSFUL WILDCATS

Cooke County: Kimbell-Sims 1 T. A. Crawford, 18-A1,248-Fannin CSL, TD 3,570 ft., pay 3,562 ft., flowed 95 bbl. 43°-gravity oil, 14/64-in. choke, TP 125 psi., GOR 500 cu. ft.

Sinclair Oil & Gas Co. 1 S. F. Murrell, A. Horton Sur. 182, 3 mi. SW Callisburg, TD 6,261 ft., perf. 3,692-3,706 ft., flowed 382 bbl. 44°-gravity oil, ¼-in. choke, TP 550 psi., GOR 900 cu. ft.

Jones County: The Texas Co. 1 F. J. McDonald, Sec. 58, Dewitt CSL, TD 4,038 ft., perf. Strawn lime 3,942-49 ft., pumped 18 bbl. 37°-gravity oil.

Stephens County: W. M. & Clarence Angle 1 R. A. Barker, Sec. 122, 9 mi. NW Cisco, TD 1,968 ft., pay 1,964 ft., pumped 33 bbl. 37°-gravity oil.

S. Caprito 1 Compton-Hazelwood, 8-7-T&P, TD 4,211 ft., elev. 1,290 ft., Ellenburger 4,160 ft., flowed 122 bbl. 42°-gravity oil, 8/64-in. choke, TP 350 psi., GOR 816 cu. ft.

Wise County: R. O. Wood 1-A Benson est., Sec. 1,391, TE&L Sur., TD 4,474 ft., perf. Caddo 4,447-74 ft., flowed 135 bbl. 42°-gravity oil, 18/64-in. choke, TP 80 psi., GOR 359 cu. ft.

NORTH CENTRAL TEXAS (DISTRICTS 9 AND 7-B) WILDCAT FAILURES

Archer County: Archer Drilling & Production Co. 1 Tomie Estill, TE&L Sur., A-606, dry, TD 1,472 ft.

Archer Drilling & Production Co. 1 Shawver, B'k. 2, EL&RR, dry, TD 1,590 ft.

Coleman County: L. J. Maxwell 2 Mattie B Miller, Sec. 728-D, Breeding Sur., dry, TD 2,130 ft.

Miami Operating Co., Inc. 1 T. J. Allen 64-1-GH&H, dry, TD 3,880 ft., Gardner 3,710 ft., Gray 3,865 ft.

Haskell County: Stanolind Oil & Gas Co. 2-B W. H. Haynes, James Joslin Sur. 160, dry, TD 5,529 ft., elev. 1,501 ft., reef 3,560 ft.

Jack County: D. H. Bolin 1 Mary Graham, 2,776-A718-TE&L, dry, TD 5,540 ft.

Panhandle Producing & Refining Co. 1 Dania Raine, T. Robbins Sur., A-489, dry, TD 5,189 ft.

Jones County: Clark & Cowden Oil Co. 1 W. M. Bower, Sec. 52, OAL Sur., dry, TD 2,797 ft.

William Crawford 1 Mrs. M. E. Rister, I. E. Sheffield Sur. 246, dry, TD 4,600 ft.

G. B. & J. R. Rice 1 Triplett, 22-15-T&P, dry, TD 3,135 ft., Swastika lime 2,575 ft., reef 3,108 ft.

RHK Drilling Co. 1-A Joe Winter, 19-19-T&P, dry, TD 4,537 ft., elev. 1,869 ft., reef 4,489 ft.

Nolan County: Skelly Oil Co. 2 L. E. Adrian, 43-20-T&P, dry, TD 6,370 ft., elev. 2,342 ft., Caddo 6,230 ft., Ellenburger 6,318 ft.

Shackelford County: E. C. Johnson et al 1 W. H. Greene, 52-11-T&P, dry, TD 1,251 ft.

Phillips Petroleum Co. 1 Roark, 45-12-T&P, dry, TD 5,057 ft., elev. 1,566 ft., Caddo 4,257 ft., Lake sand 4,590 ft., Bend conglomerate 4,642 ft., Ellenburger 4,877 ft.

United Development Co. 1 Flippen Ranch, 41-11-T&P, dry, TD 1,167 ft.

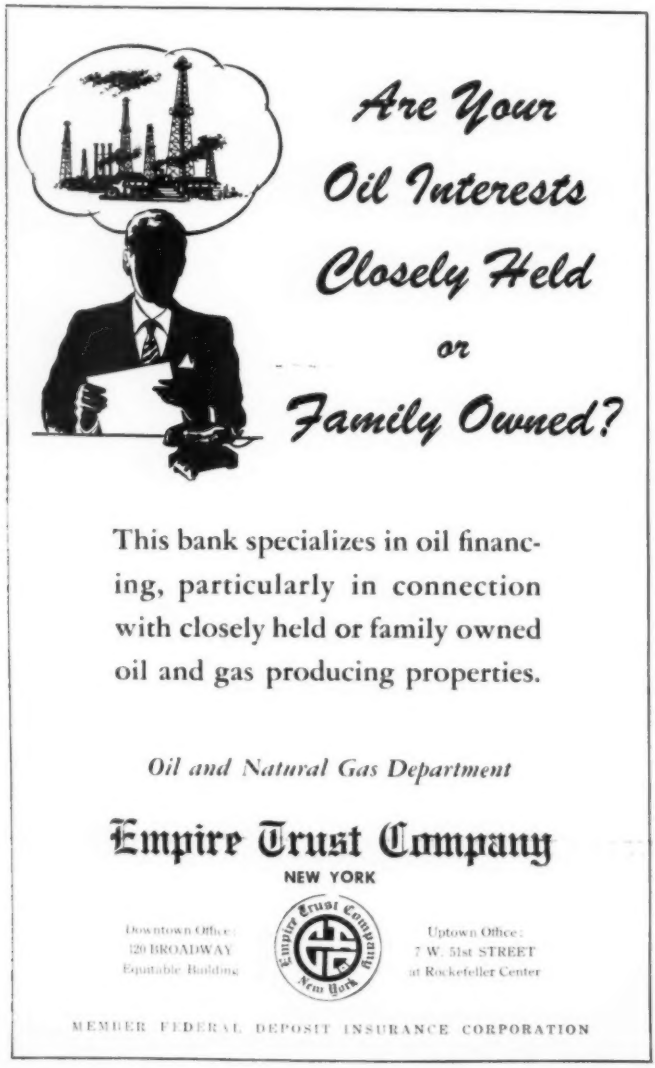
Stephens County: Roger Bauman 1 R. M. Rogers, 29-5-T&P, dry, TD 3,180 ft., Strawn sand 2,670 ft., Caddo 3,155 ft.

Stonewall County: Rowan & Hope et al 1 Gib Calloway, 57-F-H&TC, dry, TD 6,510 ft., elev. 1,782 ft., Cisco reef 3,295 ft., Hope 5,471 ft.

Continental Oil Co. 1 A. Brinkley, Jr., 7-A-Arnold & Barnett Sur., dry, TD 5,570 ft.

Leland Fikes 1 Clifton Good, 39-F-GC&SF, dry, TD 6,464 ft., elev. 1,613 ft., Caddo 5,290 ft., Bend conglomerate 5,896 ft., Ellenburger 6,175 ft.

Taylor County: Humble Oil & Refining Co.



1 R. L. Bland, 27-19-T&P, dry, TD 5,137 ft.

Robinson-Puckett, Inc., 1 A. B. Pfluger, 18-6-SPRR, dry, TD 4,996 ft., elev. 2,281 ft., Caddo 4,480 ft.

Throckmorton County: Warren Oil Co. 1 Cora Beaty, TE&L Sur., 676, A-277, dry, TD 4,612 ft., Caddo 3,690 (?) ft., Mississippian 4,494 ft.

Wichita County: Consolidated Oil Co. 4-A Laukhuf, Blk. 5, Cherokee CSL, dry, TD 4,459 ft., KMA lime 4,255 ft.

Wilbarger County: Frank Wood 1-SS W. T. Waggoner, 34-4-H&TC, dry, TD 2,005 ft.

Wise County: Cabot Carbon Co. 1 R. T. Wells, Sec. 747, TE&L Sur., dry, TD 4,749 ft.

Kansas

Barton County Leads In Kansas Discoveries

ROCKET DRILLING CO. has uncovered a prospective new pool a mile south of the Barrett pool, in Barton County, at its 1 Putnam, NW NW NW 7-17-13. The well encountered promising oil showings in both the Lansing-Kansas City and Arbuckle zones, and has casing run for completion. Top of the Lansing was logged at 3,224 ft. (—1,240 ft.), and that of the Arbuckle at 3,454 ft. (—1,470 ft.). A 60-minute drill-stem test in the Lansing at 3,247-97 ft. got a substantial showing of gas and yielded 420 ft. of heavily oil-cut mud. Bottom of the casing is 1 ft. in the top of the Arbuckle zone, which will be tested first.

Two miles to the northwest, and northwest of present production of the Barrett pool, Anschutz Drilling Co. is making a Lansing-Kansas City well at its 1 Fleming, SW SW NE 30-16-14. Hole has been plugged back from the Arbuckle, which tested considerable water with some oil, and casing perforated in the upper formation opposite an interval at 3,352-61 ft. After acidizing with 500 gal., the well swabbed an average of 12 bbl. of oil per hour.

Lario Oil & Gas Co. is preparing to test promising oil showings encountered in Reagan sand at its 1 Willcut, SE SE NW 15-19-15, ¾ mile south of the Albert pool, also in Barton County. The location is separated from the latter pool by dry holes so may indicate the discovery of a new pool. Total depth is 3,576 ft., 4 ft. in the top of the zone. A drill-stem test of the interval recovered 200 ft. of oil, 33 ft. of heavily oil-cut mud and 65 ft. of water. Tool was open only 30 minutes. Casing is on top the pay. Surface elevation is 1,929 ft.

A new pool is indicated in the southwest corner of Barton County where Victor Drilling Co. has run casing to test oil showings encountered in Arbuckle lime at its 1 Bowman, NE NE SE 27-20-15. Pay was topped at 3,662 ft. (—1,725 ft.) and drilled to 3,676 ft., where a drill-stem test, open 60 minutes, flowed gas in 25 minutes and filled 300 ft. of oil and 132 ft. of heavily oil and gas-cut mud with 35 ft. of water. Indicated bottom-hole pressure was 1,097 ft. Location is a mile south of the Bergtal pool.

Graham - Messman - Rinehart Oil Co. 1 Staab, SW SW SW 31-12-17, a mile northeast of the Ubert pool, Ellis County, swabbed at the rate of 7 bbl. of oil per hour while testing Arbuckle lime, topped at 3,599 ft. (—1,511 ft.), and open at 3,600-13 ft. The well also is a prospective discovery well in the Lansing-Kansas City lime, in which substantial oil showings were encountered.

KANSAS SUCCESSFUL WILDCAT

Seward County: Columbian Fuel and United Producing 1 Kneeland, NE NE 23-34s-31w, pumped 12 bbl. oil from Marmaton at three intervals from 5,302-62 ft., TD 6,300 ft.

KANSAS WILDCAT FAILURES

Barton County: Holl 1 Moore, SW SW SE 14-20s-13w, dry, TD 3,524 ft.

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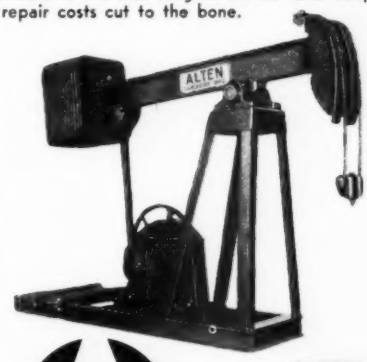

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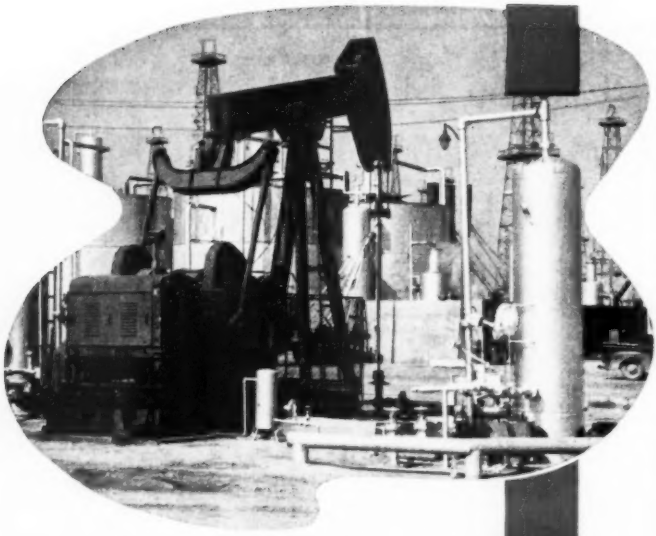

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Decatur County: Gore 1 Norris, NW NW NW 12-4s-26w, dry, TD 3,920 ft.
Ellsworth County: Skiles 1 Janssen, SW SW SW 31-17s-8w, dry, TD 3,380 ft.
Gove County: Republic Natural 1 Beazley, SE SE SE 5-14s-29w, dry, TD 4,468 ft.
Graham County: Deep Rock 1 Fabricus, SW SW NW 30-7s-21w, dry, TD 3,845 ft.
Greeley County: Duncan Drilling et al 1 Sell, C SW SE 28-18s-42w, dry, TD 5,170 ft.
Mitchell County: Texas Pacific 1 Gasper, SW NW SW 31-7s-10w, dry, TD 3,889 ft.
Norton County: Gore 1 Sheetz, SE SE SE 5-5s-25w, dry, TD 4,125 ft.
Rice County: Stearns Petroleum 1 Kemper, SW SW SW 24-21s-8w, dry, TD 3,415 ft.
Russell County: Brunson Drilling 1 Boxberger, NW NW NE 17-15s-14w, dry, TD 3,318 ft.
Saline County: Jackson et al 1 Weiss, SW SW SE 21-14s-2w, dry, TD 3,428 ft.
Anschutz Drilling 1 Krauss, SE SE NW 14-16e-1w, dry, TD 3,462 ft.
Sumner County: The Texas Co. 1 Davis, SE NW NE 13-35s-4w, dry, TD 5,200 ft.
Trego County: C-G Drilling 1 Tawney, SW SW SW 23-12s-22w, dry, TD 4,100 ft.

EASTERN NEBRASKA WILDCAT FAILURE

Harlan County: Hartman 1 Coe, NW NE SE 30-1n-17w, dry, TD 3,600 ft.

Eastern Texas

Activity to Pick Up In Grayson County

DALLAS.—Several new wildcat and development locations have been announced for Grayson County. Following completion of Mid-Continent Petroleum Co. 1 Martin as the first commercial Pennsylvanian well in the Sandusky area, Magnolia Petroleum Co. spudded in at its 1 Cooper, an east offset to the discovery. Magnolia's test is on a 195-acre lease in the R. B. Walker Survey. Mid-Continent's well gaged 252 bbl. of oil a day from sand pay at 6,912-93 ft.

S. A. Winfrey, Dallas, 1 Allen Roach will be drilled to 4,000 ft. The proposed wildcat is in the southwest corner of the county, about 1 mile south of the town of Tioga. Standard Oil Co. of Texas made location for a 9,000-ft. wildcat 5 miles southwest of the Sherman field, as the 1 Cap Bradshaw, in the L. Reed Survey. The proposed depth should explore the Simpson and Ellenburger which have been productive in the Sandusky field. North of Sandusky, L. O. McMillan 1-A Price, G. L. Scott Survey, was drilling below 5,418 ft.

In Rains County, R. J. Caraway was rigging up at 1 Jenkins-Shipp Unit, as a Smackover lime test southeast of Emory, and a long southwest outpost to the Caraway-Puckett Smackover discovery. Penrod Drilling Co. had contract for the 12,500-ft. venture and companies supporting the test included Shell Oil Co., Magnolia and Amerada Petroleum Corp.

Northeast of Quitman in Wood County, rig was being moved in for A. O. Phillips and J. B. Stephens 1 Sally Old, a 6,000-ft. wildcat in the J. B. Chirino Survey.

In Anderson County, The Texas Co. staked location for a 5,500-ft. operation as the 1 J. J. Biggan, Dickerson Parker Survey. Nearest production is southwest in Long Lake field.

EAST TEXAS (DISTRICTS 5 AND 6) WILDCAT FAILURES

Falls County: W. H. Green 1 S. T. Travis, P. Zarza Sur., dry, TD 810 ft.
Rusk County: Continental Oil Co. 1 Frank Lewis, H. Wright Sur., 8 mi. NE Henderson, dry, TD 7,612 ft., Massive anhydrite 6,050-6,298 ft.

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Oklahoma

Springer Extension Well Produces at Fox-Graham

MAGNOLIA PETROLEUM CO. 9 Lahman, SW NE NE 25-2s-3w, Springer sand extension well in the Fox-Graham field, Carter County, flowed 119 bbl. of 39.8 -gravity oil on a 24-hour production gage through ¾-in. choke and proves a sizable new area for development. Location is 2½ miles southeast of nearest Springer production in the field.

Production is from two intervals in the Springer section with casing perforated at 6,775-80 ft. and 6,885-95 ft. Top of the section was logged at 6,538 ft. Showings were logged through most of it, drilled to a total depth of 7,011 ft. Casing was run to 6,995 ft. and hole plugged back to 6,929 ft.

Kirkpatrick Oil Co. has a prospective Springer sand discovery producer in the Tatums field, also in Carter County, where its 5-C Epley, NW SW NW 9-1s-3w, started as a geological exploratory test, found promising oil showings in the Goodwin (lower Springer) sand, logged at 5,744-76 ft. A drill-stem test, taking in an interval at 5,752-92 ft., flowed gas in 55 minutes and recovered 180 ft. of oil-cut mud. Hole was deepened to 6,000 ft. and casing has been run through the zone to 5,847 ft.

Skelly Oil Co. has run casing in its 1-A Robberson, SW SE SE 34-1s-5w, prospective Springer sand discovery well on the west flank of the Velma pool, Stephens County. Total depth is 5,300 ft. with 7-in. casing at 4,747 ft. The well is reported to have flowed at the rate of 5 bbl. of oil per hour in a drill-stem test in Springer sand at 3,006-3,106 ft.

Another new pool is in the making in Payne County where Tom G. Prior is preparing to test his 1 Vincent, NE NW NW 23-20n-4e. Prospective pay is the Misener in which good staining and oil shows were logged at 3,964-68 ft. A drill-stem test, open 1 hour, and taking in a section extending from 3,923 ft. to 3,970 ft., got a gas flow estimated at 50,000 cu. ft. per day, and recovered 60 ft. of clean oil with 420 ft. of oil-cut mud. When the well was shut in, bottom-hole pressure built up to 1,450 ft. in 15 minutes. Casing was run to 3,964 ft. with open hole to 3,971 ft. The location is 12 miles northeast of Stillwater and 1¼ miles northwest of the one-well Westpoint pool.

Wilcox Oil Co. and associates recovered 125 ft. of clean oil and 100 ft. of heavily oil-cut mud in a drill-stem test of Skinner sand at 4,300-14 ft. at their 1 Lee, NE NE SW 10-18n-2e, a wildcat 5 miles southwest of Stillwater and 2 miles southeast of the Northeast Ramsey pool, Payne County. Operators are drilling ahead to their original objective, the Mississippian, and possibly the Wilcox. Bartlesville sand carried a slight show but a drill-stem test of the zone at 4,449-83 ft. got mostly water.

OKLAHOMA SUCCESSFUL WILDCAT

Grant County: Cummins, McIntyre, and Mid-Continent 1 Combs, SE SE NE 6-25n-5w, flowed 405 bbl. oil from Marshall and Wilcox sands at 5,958-73 ft and 5,975-79 ft., TD 5,982 ft.

OKLAHOMA WILDCAT FAILURES

Cotton County: Halliburton Co. 1 Rhoades NE NE SE 12-1s-10w, dry, TD 2,419 ft

Hutcheson 1 Curtis, SE NW NW 31-1s-11w, dry, TD 2,316 ft.

Beck and Davenport Drilling 1 Henderson, SW SW NW 25-4s-11w, dry, TD 2,808 ft.

Custer County: Brill 1 Newcomb, C NW NW 10-12n-16w, dry, TD 9,358 ft.

Kay County: Morgan 1 Savage, NW NW SE 32-8n-1w, dry, TD 3,512 ft.

Lincoln County: Jones and Evans 1 Harding heirs, NE NE SW 31-16n-5e, dry, TD 3,976 ft.

Okmulgee County: Nellis et al 1 Martin NE NE NE 12-12n-12e, dry, TD 2,450 ft

Pottawatomie County: Continental Oil 1 Baade, NE NE NE 20-11n-2e, dry, TD 5,676 ft.

Seminole County: Hawkins and Ratner 1 Ellis, NE NE SE 31-11n-6e, dry, TD 3,655 ft.

Stephens County: Richardson 1 Sikes, SE SW SE 12-1s-8w, dry, TD 5,452 ft

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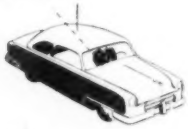

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California

Camden Development Finds Thin Pay Zone

LOS ANGELES—A link well midway between the discovery of Camden field Fresno County, and the second well, which extended production 1¼ miles to the northwest, was being completed at the weekend. However, like the first two wells it found only a thin sand section so that it is yet to be proved whether the field will be of economic importance.

The connecting well is Universal Consolidated Oil Co. 18-5 McVicar, in SW SW Section 5-17s-20e. Drilled to 6,250 ft. it has 7-in. casing set at 6,151 ft. and gun-perforated at 6,017-11 ft. The producing sand is the Zilch formation, Miocene age, which is the pay being produced at Riverdale 4 miles to the southwest. The thickest section found in any of the three wells has been only about 10 ft. Because of this thin section, development is not too attractive even though Universal Consolidated showed the wells can be drilled in 13 days.

An unusually large number of rank wildcats and extension attempts were getting under way or were staked for early drilling. About 1½ miles south of San Ardo

field in Monterey County, Wilshire Oil Co. staked 71-26 Hunter-Dryden in NE NE Section 26-23s-10e. Macson Oil Co. announced it will drill 1 Linn in SW SW Section 5-26s-12e, midway between Paso Robles and San Miguel. In San Benito County, Lonoak area, Standard Oil Co. of California has staked 53-26 Eade in Section 26-18s-9e. In the San Joaquin Valley, San Joaquin Syndicate was moving in a rig to drill 1 Tejon in Section 21-11n-19w, 2 miles north of Tejon production.

The McNally ranch near Santa Fe Springs and West Coyote oil fields southeast of Los Angeles shortly will receive another test. The wildcat will be drilled by The Texas Co. in NW 23-3s-11w, on a 1,700-acre lease recently acquired by Paul Trousdale and Ted Sterling. Their lease extends over portions of Section 15, 22, 23, and 24. Humble Oil & Refining Co. also recently obtained a 180-acre lease in SE Section 10, upon which Western Gulf Oil Co. reportedly may soon drill. All together some 20-odd wildcats have been drilled on the 2,200-acre ranch, including 6 tests below 9,000 ft.

Two extension tests also were announced for Los Angeles County fields. Standard of California has staked its 52-19 Newhall Land & Farming-6 in NE Section 19-4n-16w, about ½ mile northeast of Castaic Junction field. At Puente, Richfield Oil Corp. staked A-1 Hurley in NE Section 9-2s-10w, or about ½ mile southwest of Dewitt Longford's recently completed 2 Vanderhoof.

Deep pay possibilities of Paloma field shortly will be explored, with the test possibly being carried as deep as 18,000 ft. or 20,000 ft. in search of Eocene production. The test will be drilled in Section 4-32s-26e. Pipe will be set through the regular Paloma pay at about 10,000 ft. The deepest hole to date in the field is Superior Oil Co. 56-35 Anderson. It was carried to about 14,500 ft. before plugging back for completion in the regular pay.

In Sutter County's Princeton gas area, H. H. Magee, Operator, has staked location for a 3-mile southeast step-out to Honolulu Oil Corp. recent gas discovery. The new wildcat will be the 1 McMurty, in SE Section 27-17n-1e. The discovery, 1 Humble-Wild Goose, was completed at 3,294-3,314 ft. for a 3,500,000-cu. ft. gas well.

CALIFORNIA SUCCESSFUL WILDCATS

Kern County, Rosedale area: Humble Oil & Refining Co. 1 Rosedale-Stevens Comm., NW SE 15-29s-26e, flowed 507 bbl. 31.5°-gravity oil, perf. 5,890-5,955 ft., ¼-in. bean, Stevens sand 5,892 ft., TD 7,321 ft., elev. 370 ft.

Kings County, ½-mile north extension to Pyramid Hills field: Caravan Oil Co. 1 Pyramid, SW SW 8-24s-18e, pumped 10 bbl. 27°-gravity oil, perf. 940-1,095 ft. and 1,325-1,400 ft., TD 2,968 ft., PB 1,450 ft., elev. 790 ft.

CALIFORNIA WILDCAT FAILURES

Kern County, Devils Den area: Elko Drilling Co. 1 Elko-Smith, 29-25s-18e, dry, TD 1,300 ft., elev. 1,029 ft.

Edison area: Cliff Z Ligitt 2 Cliff, 27-30s-30e, dry, TD 800 ft., elev. 930 ft.

Trico Oil & Gas Co. 1 Hadad, 4-30s-29e, dry, TD 5,181 ft., elev. 566 ft.

Los Angeles County, Canoga Park area: W. C. Blanks 1 Blanks, 4-1n-17w, dry, TD 510 ft., elev. 1,200 ft.

San Luis Obispo County, Temblor Range area: British American Oil Producing Co. 3 Dodds-Thomas-Unit, 9-31s-21e, dry, Eocene 3,700 ft., TD 3,890 ft., elev. 3,090 ft.

Santa Barbara County, Figueroa Mountain area: Honolulu Oil Corp. 1 Mills, 26-8n-30w, dry, TD 4,845 ft., elev. 3,888 ft.

Santa Maria area: J. M. Irish 1 Bognuda, 31-11n-34w, dry, TD 1,350 ft., elev. 138 ft.

Santa Cruz County, Santa Cruz area: Union Oil Co. 1 Teresa Hihn, 34-10s-1e, dry, TD 7,747 ft., elev. 1,050 ft.

Ventura County, Tin-Top Fresno area: Union Oil Co. 4 Weldon Canyon, 3-3n-23w, dry, TD 3,942 ft.

Yolo County, Winters area: E. A. Bender 1-1 Bender-Winters Comm., 18-8n-1e, dry, TD 4,600 ft., elev. 116 ft.

Mississippi

Tests Continue at Lion's Franklin County Prospect

JACKSON.—In southwest Franklin County, Lion Oil Co. 1 Thomas, 3-4n-1e, prospective Wilcox discovery has casing landed at 6,621 ft. and operator is testing. Casing was perforated at 6,381-87 ft., and the well started cleaning on 3/64-in. choke at the rate of 1 bbl. per hour. After 4 hours, the choke was changed to 10/64-in., and the well flowed at the rate of approximately 100 bbl. of fluid per day, being 90 per cent oil and 10 per cent wash water. At the last report, it was flowing on 12/64-in. choke at the rate of 150-200 bbl. per day with 12-20 per cent slightly brackish water.

In Pistol Ridge field area of Forrest County I. P. LaRue and American Liberty Oil Co. 1 Forest Products Co., 17-1s-13w, ran drill-stem tests at 8,082-90 ft. in the lower Tuscaloosa. On 22-minute tests, using 1,000 ft. of water cushion and ¼-in. chokes, fluid hit the surface in 9 minutes. Maximum top pressure was 2,200 psi. and recovery was 260 ft. of clear to straw-colored condensate. A core was cut at 8,090-8,120 ft. with recovery being shale and tight sandstone. Electric log indicates permeable sand at 8,073-81 ft. in the lower Tuscaloosa "stringer" section.

Humble Oil & Refining Co. has abandoned 1 Bill Fortenberry, 27-2n-9e, wildcat in southeastern Pike County. The hole was drilled to a total depth of 12,000 ft. in the lower Cretaceous. The well was

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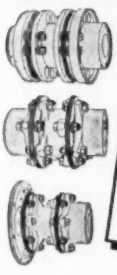

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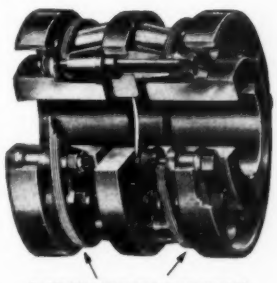

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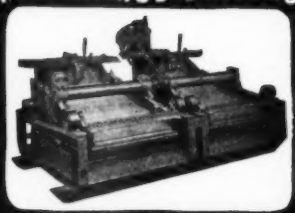

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tested in several places but none of the sands proved to be commercially productive.

MISSISSIPPI WILDCAT FAILURES

Adams County: Humble Oil & Refining Co. 1 Rogers G. Davis et ux, 41-6n-3w, dry, TD 6,510 ft.

Jefferson County: Paul Ratliff 1 E. L. Johnson, 45-10n-1w, dry, TD 6,015 ft.

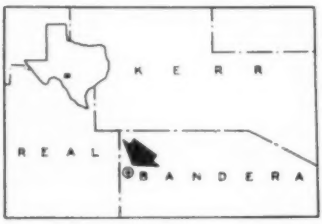
Pearl River County: Roeser & Pendleton, Inc., 2 Crosby Lumber Co. et al., 15-1s-17w, dry, TD 9,443 ft.

Pike County: Humble Oil & Refining Co. 1 Bill Fortenberry, 27-2w-9e, dry, TD 12,000 ft.

Southwest Texas

Bandera County May Have Highly Important Discovery

CORPUS CHRISTI—Although wholly unconfirmed, sources considered to be reliable indicate that a new oil strike is the offing in the rank wildcat "Hill Country," which undoubtedly will set off a spirited oil play in this highly speculative area.



Mikton Oil Co. of Houston 1 W. F. Stelzer is reported to have encountered oil shows in the Pennsylvanian series above 3,000 ft. and drill-stem tests are believed to have shown sufficiently to warrant completion attempts. However, operator is drilling ahead in search of lower zones, and will possibly drill on to the original contract depth of 8,000 ft. This wildcat is located ½ mile west of Vanderpool in Bandera County, and 8,500 ft. east of the Bandera-Real County line. (See location map.)

This well, if productive, will likely be considered one of the major strikes for the state, inasmuch as it will open for development the vast region known as the lower Edwards Plateau, long considered a potential major reserve. West Texas drilling has pushed production to the upper fringe of the plateau, but this well would be the first in the "Hill Country" proper.

Atlantic Refining Co. has set production string in 1 State Tract 411, wildcat which may be the link between Red Fish Bay and Mustang Island fields, Nueces County. Operator is preparing to test good oil shows cored at 3,194-3,248 ft. Varied gas shows were also cored at 7,111-82 ft. This possible link well is 1½ miles north of Mustang Island gas-condensate production.

Five miles south of Big Foot, Frio County, Forney and Winn 1 Alma Marburger, oil discovery, is pumping an estimated 35 to 40 bbl. of oil daily. Completion was made from a highly saturated sand section of the Navarro zone at 3,495½-3,536 ft. The new discovery is located ¾ mile south of Big Foot field.

Sun Oil Co. 2 Blas Requenez et al, wildcat in the North Sun area of Starr County, flowed 29.4 bbl. of condensate from perforations at 5,075-88 ft. Tubing pressure was 1,890 psi. This gage was made through ⅛-in. choke and well is reported to be shut in for potential.

SOUTHWEST TEXAS (DISTRICTS 1 & 4) SUCCESSFUL WILDCAT

Kenedy County: New pay at Sarita—Humble Oil & Refining Co. B-28 John G. Kenedy, Jr., A/c-1, El Paistle grant, TD 9,500 ft., perf. 6,423-31 ft., IP 107 bbl. oil per day, ¼-in. choke, 41° gravity, comp. 10-51.

SOUTHWEST TEXAS (DISTRICTS 1 & 4) WILDCAT FAILURES

Bell County: J. P. Bristow & Co. 1 Hugo Wolf, A. G. Moore Sur., A-848, dry, TD 1,097 ft.

Brooks County: Nor-Mac Burns Co. 1 J. L. Cage, Sec. 713, Tex-Mex RR Sur., dry, TD 7,015 ft.

Duval County: Panhandle Producing & Refining Co. 1 Dinn, H. K. Allison Sur. 458, Blk. 5, dry, TD 3,521 ft.

Medina County: Edwill Oil Co. 1 R. Foster, H. M. Moore Sur., dry, TD 2,300 ft.

Nueces County: Gulf Plains Corp. 1 Chapman Ranch, Sec. 116, Laureles Farm Tract, dry, TD 7,505 ft.

Starr County: Continental Oil Co. 16 W. 1 Cameron, CCSD&RGNG Sur. 238, dry, TD 4,255 ft.

Val Verde County: Honeycutt & Thomas 1 Fee, Jessie Robinson Sur. 764, A-1332, dry, TD 1,267 ft.

Webb County: Paisano Trading Co., Ltd. 1 Mrs. Anna L. Connevy, Mrs. Georgia Schwartz Sur. 105, dry, TD 4,012 ft.

Williamson County: M. J. Simmons 2 Annie Pfluger Est., W. S. Parker Sur. 102, 2 mi. W of Thrall, dry, TD 886 ft.

Zapata County: Charles E. Long 1-A Mrs. Noyes Smith et al, Blk. 1, Harvey Subd., El Javali grant, dry, TD 1,700 ft.

Ben D. Marks, Trustee, Arturo Ramirez et al, Blk. 3, S. T. Phelps Subd., Share A of Villa grant, dry, TD 2,700 ft.

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Texas Gulf Coast

Another Pool for Goliad County

HOUSTON.—Kirkwood & Co. et al. 1 William Hoff, wildcat 2⅛ miles east southeast of South Weesatche gas field, Goliad County, had good oil recovery on drill-stem test, indicating a new pool for the area. From perforations at 8,998-9,013 ft., recovery was 1½ stands of oil. Bottom-hole flowing pressures were 555-3,190 psi. Another test at 9,000-16 ft. had recovery of 3½ stands of oil and 2½ stands of oil-cut mud with fresh water.

In Live Oak County, Sunray Oil Corp. 1 W. A. Smith, wildcat north and across a fault from oil and gas production in the Dilworth area, topped the Luling sand at 6,775 ft. and cored condensate shows for 10 ft., and operator is preparing to drill-stem test at 6,777-85 ft. An earlier drill-stem test of the Slick at 6,704-17 ft. had recovery of water cushion and 50 ft. of rathole mud both slightly cut with distillate. A drill-stem test of the Slick-Carrizo at 6,647-59 ft. had recovery of distillate with good pressures.

Kirkwood & Co. has an indicated new condensate strike in DeWitt County at 1 A. G. Drier, wildcat 5½ miles southwest of Arneckville gas production. On drill-stem test at 8,405-20 ft., recovery was 10 ft. of condensate, 368 ft. of water cushion, 281 ft. of muddy water and 30 ft. of muddy condensate-cut water. Operator is coring at 8,450 ft.

Woodley Petroleum Co.-Stanolind Oil & Gas Co. 1 Iris Clark, new upper Wilcox pool opener in Grimes County, is still testing. Latest gage showed the well good for 18 bbl. of oil and 13 bbl. of water through 12/64-in. choke. Upper Wilcox was opened with perforations at 4,688-90 ft.

C. G. Glasscock has made a good show of condensate on drill-stem test at 1 W. A. Street, wildcat 3½ miles northeast of South Long Mott field, Calhoun County. From perforations at 5,773-80 ft., well developed 450 psi. working pressure at the surface and recovery was 6 stands of condensate. Operator squeezed and will test the 5,875-ft. zone.

In Liberty County, General Crude Oil Co. 5-C Esperson, wildcat, is showing for a gas discovery from perforations at 8,890-94 ft. Drill-stem test of that interval had gas to surface in 15 minutes through ¼-in. chokes. Test also had some distillate. Hole is bottomed at 10,459 ft. and plugged back to 9,070 ft.

TEXAS GULF COAST (DISTRICTS 2 AND 3) SUCCESSFUL WILDCATS

Brazoria County: Gas discovery—Brazos Oil & Gas Co. 1 Ducroz et al., Calvin Sumrells Sur., A-368, TD 7,804 ft., perf. 3,068-80 ft., IP: completed as gasser, no gage, comp. 9/51.

DeWitt County: New pay at Helen Gohlke—Shell Oil Co. 4 Helen Gohlke, H. C. Kitchen Sur., TD 8,262 ft., Yegua 5,354-58 ft. (new pay), IP: 157 bbl. oil per day; Wilcox 8,132-44 ft., IP: 200 bbl. oil per day, comp. 9/51.

Live Oak County: New pay at Chapa—Atlantic Refining Co. 1 Sanger Heirs, GC&SF RR Co. Sur. 391, A-711, TD 9,298 ft., perf. 8,658-70 ft., IP: 240 bbl. cond. per day, 53°-gravity, TP 3,000 psi., comp. 9/51.

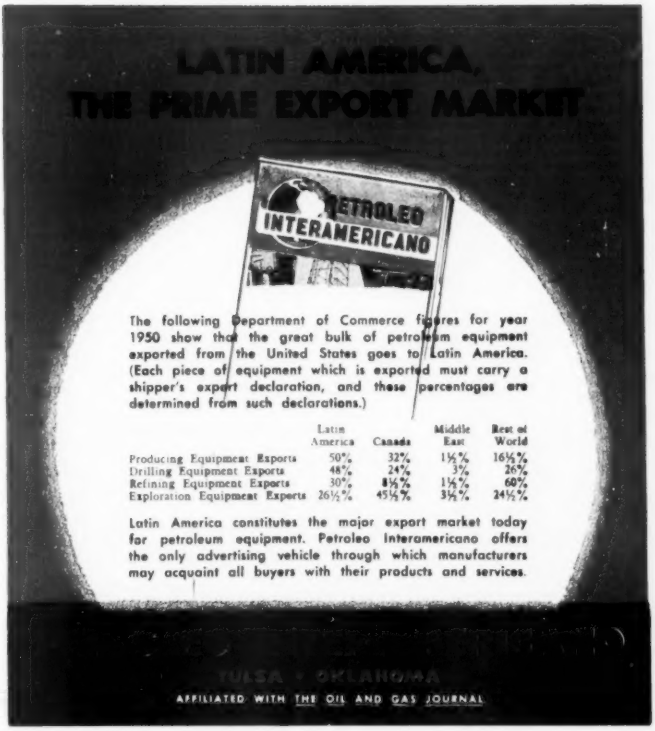
Washington County, New pay at Old Washington—Sinclair Oil & Gas Co. 2 Bess Henry, William Gates League, A-46, TD 10,745 ft., Wilcox 8,950-60 ft., IP: 68 bbl. cond. per day, comp. 9/51.

TEXAS GULF COAST (DISTRICTS 2 AND 3) WILDCAT FAILURES

Fort Bend County: U. M. Harrison & F. H. Carpenter 1 Paul Schumann, et al., M. M. Battle Sur., dry, TD 8,512 ft.

J. P. Petkas 1 V. A. Hartburg, Antonio Vail Sur., A-106, dry, TD 5,700 ft.

Harris County: Rowan Oil Co. et al. 1 E. G.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Producing Equipment Exports 50% 32% 1½% 16½%
Drilling Equipment Exports 48% 24% 3% 26%
Refining Equipment Exports 30% 8½% 1½% 60%
Exploration Equipment Exports 26½% 45½% 3½% 24½%
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Weiman, Michael McCormick Sur., A-533, dry, TD 7,797 ft.

Jackson County: J. K. Dorrance 1 Mrs. Lucy McCarty, W. J. Wickham Sur., A-272, dry, TD 5,400 ft.

Jefferson County: Magnolia Petroleum Co. 1 B. C. Hebert Trust, T&NO Sur. 285, dry, TD 12,780 ft.

Karnes County: Kirkwood & Co. and Alex W. Head 1 H. A. Discher, Carlos Martinez grant, A-6, dry, TD 6,755 ft.

Martin, Shelly & Thomas 1 Peter Danysh, Blk. 8, Cora Butler Sub. of Bartlett Hickman Sur. 136, A-35, dry, TD 4,235 ft.

Lee County: Carter Taylor 1 G. B. Nieton, John C. Walker Sur., A-365, dry, TD 6,251 ft.

Matagorda County: Barnhart & B.B.M. Drilling Co. 1 M. C. Johnson, Thomas M. Duke Sur. 30, dry, TD 10,453 ft.

Gulf Oil Corp. 1 H. B. Hawkins, et al., J. Dwyer Sur., A-31, dry, TD 10,723 ft.

San Jacinto County: Shell Oil Co. 1 Mrs. L. B. Modesett, et al., J. D. Martinez Sur., A-4, dry, TD 8,623 ft.

Wharton County: Hamman Oil & Royalty Co. 1 Marjorie Child Husted, et al., N. B. Williams Sur., A-352, dry, TD 7,606 ft.

Permian Basin

Irion County Discovery Readies for Potential

MIDLAND.—Moore Exploration Co. 1 W. M. Noelke, Irion County's Ellenburger discovery some 10 miles southwest of Mertzon in about the south center of the county, was ready for potential after making a number of flowing tests.

Top of the Ellenburger was 7,804 ft., on elevation of 2,298 ft. The well was drilled to 7,838 ft. and had casing set to 7,806 ft. The first drill-stem test at 7,780-7,830 ft. had gas in 6 minutes but did not flow oil. Recovery was 1,260 ft. of 40°-gravity oil. The well flowed 29 bbl. of oil in 3 hours through open 2-in. tubing. It was treated with 500 gal. of acid, after which it flowed 137 bbl. of oil in 18 hours through 13/64-in. choke.

Further drilling is expected in the immediate area. Moore Exploration is headed by John Moore of San Angelo and P. D. Moore of Midland, and its owners include Norwood Drilling Co. of Wichita Falls and Pan American Production Co. of Houston. Norwood's rig drilled the 1 Noelke. According to reports, Moore Exploration holds some 2,200 acres around the well, while American Republics Corp. holds the north offset location and W. J. K. Vanston holds the west offset.

In east-central Irion County, MJ&M&M Consolidated 1 Calvin H. Sugg, 10,000-ft. wildcat, was drilling ahead at 7,505 ft. On elevation of 2,401 ft., the well had top of the Spraberry at 4,865 ft. A drill-stem test in the top of this section had some gas-cut mud but further tests had no shows.

In southeastern Irion, G. W. Strake 1 Mrs. L. S. Winterbotham, 30-21-H&TC, plugged back from the Ellenburger at 8,013 ft. to 6,700 ft., and perforated at 6,588-6,605 ft. for testing. Drill-stem tests in an unidentified section starting at 5,670-91 ft. had encouraging shows. From 5,890-5,900 ft. recovery was gas-cut mud, and at 6,590-6,608 ft. the well unloaded oil while pulling drill pipe.

Atlantic Refining Co. has completed another discovery in Block 2 of northeastern Reagan County. The latest is 1-B J. D. Sugg, 1 mile south of the Sugg Wolfcamp field discovery (see wildcat paragraphs following). The unusual aspect of the 1-B Sugg was that it completed natural for a relatively high flowing potential of high-gravity oil. On a test between 5,495-5,556 ft., total depth, the well flowed 23 bbl. of oil in 1 hour through 3/4-in. choke, 100 bbl. of oil in 8 hours through 20/64-in. choke, and made its completion potential of 405 bbl. of 43.7°-gravity oil a day through 1/2-in. choke on tubing. Flowing tubing pressure on the completion test ranged from 100-650 psi, and gas-oil ratio was 901 cu ft. Texas Pacific Coal & Oil Co. will drill an east offset to the 1-B Sugg, as its 1 J. F. Holt.

In Midland County, American Viking Corp. 1 McCaughey, 1 mile north of nearest production on the northwest side of Parks field, had good shows of oil and gas on a drill-stem test in the Pennsylvanian from 10,468-10,559 ft. On elevation of 2,787 ft., top of the Pennsylvanian was 10,161 ft. The first test at 10,198-10,252 ft. recovered drilling mud with no shows. A 3-hour test from 10,468-10,559 ft. had gas in 12 minutes and recovered 960 ft. of heavily oil and gas-cut drilling mud. Operators were running a test between 10,268-83 ft.

Northeast of Vincent in Howard County, Lloyd H. Smith, Inc. 1 John Boyd developed 1,800 ft. of clean oil plus 100 ft. of heavily oil and gas-cut mud on a drill-stem test in Pennsylvanian reef at 7,668-7,711 ft. Tentative top of the reef has been called at 7,480 ft. with top of first porosity at 7,680 ft. Elevation is 1,964 ft. An earlier test of the reef developed a flow of 50 bbl. of oil an hour.

Deep Rock Oil Corp. 1 J. O. McCrary, north of Big Spring, continued testing. At last report the gage was slightly under 3 bbl. of oil in 6 hours through 11/64-in. choke, with the pay section perforated at 9,068-89 ft.

WEST TEXAS (DISTRICTS 8 AND 7-C) SUCCESSFUL WILDCATS

Borden County: Vickers Petroleum Co., Inc. 1 Myrtle McKnight, 367-97-H&TC, TD 7,760 ft., elev. 2,469 ft., reef 7,735 ft., flowed 11 bbl. 38°-gravity oil.

Glasscock County: Sohio Petroleum Co. 5-A R. S. Davenport, 14-37-3S-T&P, TD

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6,972 ft., elev. 2,724 ft., Spraberry pay 6,948 ft., flowed 328 bbl. 38°-gravity oil, ½-in. choke, TP 120 psi., GOR 810 cu. ft.

Reagan County: Atlantic Refining Co. 1 Sugg, 134-2-T&P, TD 10,285 ft., PB 8,217 ft., elev. 2,646 ft., Wolfcamp pay at 8,100-20 ft., flowed 103 bbl. 45°-gravity oil, ¼-in. choke, GOR 2,528 cu. ft., TP 100 psi.

Runnels County: Vincent & Welch 1 Brown, Austin & Williams Sur., 9 mi. SE Winters, TD 4,257 ft., perf. 3,751-61 ft., flowed 52 bbl. 41°-gravity oil, 40/64-in. choke.

Upton County: Paul Barnhart 1-44-"B" Tippett, 44-38-5S-T&P, TD 7,309 ft., elev. 2,748 ft., Spraberry 7,243 ft., flowed 215 bbl. 37°-gravity oil, ⅜-in. choke, GOR 725 cu. ft., TP 140 psi.

WEST TEXAS (DISTRICTS 8 AND 7-C) WILDCAT FAILURES

Borden County: Jackson, Douglas & Ritchie 1 W. E. Murphy, 82-25-H&TC, dry, TD 7,501 ft., elev. 2,258 ft., reef 6,830 ft.

Crockett County: Pure Oil Co. 1 E. C. Mitcham, 8-AB-GC&SF, dry, TD 1,576 ft.

Dawson County: Sunray Oil Corp. 1 A. A. Harris, 2-26S-Moore CSL, dry, TD 10,718 ft., Spraberry 7,872 ft., reef 10,445 ft.

Howard County: Cosden Petroleum Corp. 1 L. S. McDowell, 3-34-2S-T&P, dry, TD 8,790 ft., elev. 2,467 ft., Spraberry 5,890 ft., Wolfcamp 6,880 ft.

Cosden Petroleum 1 F. W. White, 36-32-1N-T&P, dry, TD 5,609 ft., elev. 2,538 ft., Spraberry 5,550 ft.

Lynn County: Humble Oil & Refining Co. 1 Launa Thomas, 35-H-EL&RR, dry, TD 11,526 ft., elev. 3,112 ft., Strawn 9,705 ft., Mississippian 10,640 ft., Devonian 11,150 ft., Ellenburger 11,330 ft.

Midland County: Cumberland & Weiner 1 Lay Powell, 4-36-2S-T&P, dry, TD 11,845 ft., elev. 2,668 ft., Spraberry 7,112 ft., Pennsylvanian 8,600 ft., Strawn 10,312 ft., Devonian 11,128 ft., Ellenburger 11,680 ft.

Pecos County: Hunt Oil Co. 13 Elsinore, 76-B-GC&SF, dry, TD 1,680 ft.

Runnels County: Creslenn Oil Co. 1 E. O. Lange, Sec. 262, Austin & Williams Sur. 2, dry, TD 4,297 ft., Capps 3,540 ft., Fry 3,663 ft.

Schleicher County: Hiawatha Oil & Gas Co. 1 J. Harkey, 77-H-GH&SA, dry, TD 6,183 ft., elev. 2,440 ft., Canyon 4,840 ft., Strawn 5,487 ft., Ellenburger 5,974 ft.

Sutton County: Skelly Oil Co. 1 E. D. Reiley, 42-5-TW&NG, dry, TD 5,558 ft., elev. 2,459 ft., Permo-Pennsylvanian 3,390 ft., Strawn 3,865 ft.

Tom Green County: G. W. Strake 1 C. J. Urban, 109-11-SPRR, dry, TD 5,370 ft., elev. 1,810 ft., Permo-Pennsylvanian 4,062 ft., Strawn 4,515 ft., Ellenburger 5,108 ft.

SOUTHEASTERN NEW MEXICO

HOBBS.—Phillips Petroleum Co. 1 Fort Lea County Devonian discovery or 2½-mile north extension to Denton field, completed flowing 1,344 bbl. of 47°-gravity oil a day. Potential gage was through ½-in. tubing choke from perforations at 12,564-12,630 ft. and 12,660-12,710 ft. The new producer is in Section 34-14s-37e.

Magnolia 1 Pope, deep operation north of Denton field, was attempting a drill-stem test at 12,426-85 ft.

The Texas Co. 1-AT State, 2 miles north of production in Saunders field, perforated casing from 9,896-9,910 ft. and prepared to test.

Humble Oil & Refining Co. 1 Federal-Elliott, Lea County wildcat west of Lovington, was drill-stem testing in lime and shale at 10,703 ft.

In the Crossroads area, Magnolia Petroleum Co. finaled an important extension at its 1-D Santa Fe. Completion test was 243 bbl. of 47°-gravity oil a day through 24/64-in. choke on perforations at 9,618-26 ft.

SOUTHEAST NEW MEXICO WILDCAT FAILURES

Eddy County: D. L. McBride 1 Randel-Federal, 7-26s-26e, dry, TD 2,702 ft., elev. 3,541 ft., Delaware sand 1,760 ft.

Lea County: E. R. Brann 1 H. L. Lowe, 33-14s-37e, dry, TD 13,001 ft., elev. 3,858 ft., San Andres 4,795 ft., Glorietta 6,390 ft., Abo 8,330 ft.

Roosevelt County: Baker & Taylor Drilling Co. 1 Best, 25-2s-30e, dry, TD 3,755 ft., elev. 4,482 ft., San Andres 2,820 ft., Glorietta 3,705 ft.

TEXAS PANHANDLE (DISTRICT 10) WILDCAT FAILURES

Briscoe County: Hunt Oil Co. 2 Ritchie, 34-G5-H&GN, 2 mi. S and 10 mi. W of NE corner of county, dry, TD 7,764 ft., elev. 2,597 ft., Pennsylvanian 4,755 ft., Canyon reef 5,172 ft., Chester 6,510 ft., Osage 6,852 ft., red granite 7,761 ft.

Childress County: Skiles Oil Corp. 1 Cliff Campbell, dry, TD 4,865 ft., elev. 1,824 ft., Mississippian 4,470 ft., Ellenburger 4,750 ft.

Ochiltree County: The Texas Co. 1 McGarraugh, dry, TD 9,173 ft., elev. 3,045 ft., Morrow sand 9,173 ft.

South Louisiana

Cameron Wildcat Finaled; New Pay for Iowa Field

NEW ORLEANS.—Pan American Production Co. has completed 1 Miami Corp., 4-15s-3w, wildcat southeast of production in Pecan Lake field, Cameron Parish, and well is now shut in waiting on official test.

From perforations at 12,324-44 ft. and 12,362-72 ft., the well had an initial flow of

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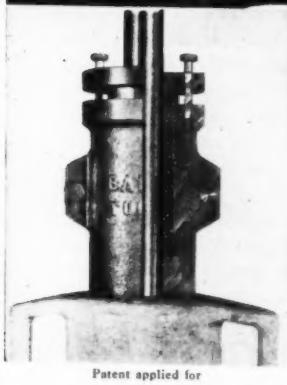

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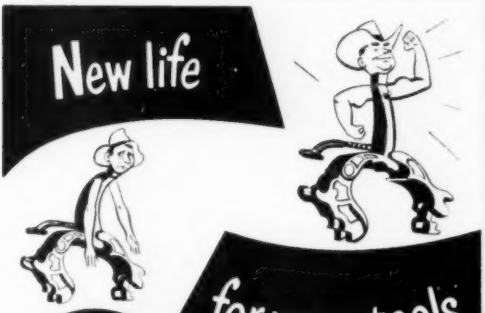

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20,500,000 cu. ft. of gas plus an ungaged amount of condensate. Tubing pressure was 4,465 psi. The well encountered a 120-ft. gas sand section between 12,105 and 12,392 ft.

New pay has been established in Iowa field, Calcasieu Parish, at Louis J. Roussel 2 R. Haggert, et al., 11-9s-7w. On initial production test, the well flowed 332 bbl. of 50°-gravity condensate plus 3,100,000 cu. ft. of gas through 12/64-in. choke. Flowing tubing pressure registered 5,700 psi. Production is through perforations at 11,023-34 ft., which is the deepest pay horizon thus far in the field. Location is on the extreme western flank of the field.

The Texas Co. has plugged and abandoned its Blind Bay wildcat, 1 State-Blind Bay, 22s-21e, Plaquemines Parish, at total depth of 16,003 ft. The well had only slight shows of gas on test.

Humble Oil & Refining Co. has drilled its Terrebonne Parish wildcat, 1 LL&E "D," 32-19s-20e, to total depth of 12,160 ft. and is now waiting on cement after setting 7-in. casing at 12,159 ft. This wildcat is in the Bayou Jean la Croix sector of the parish, and reportedly encountered salt water at total depth.

A new wildcat venture for Acadia Parish is Bates & Cornell 1 Edward Martin, 4-8s-2w, which will be drilled to 10,200 ft.

In the same parish, Cities Service Oil Co. will drill 1 Winston Atteberry "B," 56-7s-1e, to 9,500 ft. The test is approximately 4 miles west of the firm's recently completed failure.

SOUTH LOUISIANA WILDCAT FAILURES

St. Tammany Parish: Ray Oil Co. 1 Leshok, 5-6s-10e, dry, TD 7,214 ft.

Rocky Mountain

Sinclair Gets Oil Prospect At Powder River Flanker

DENVER.—Sinclair Oil & Gas Co. recovered oil on drill-stem test of the first Wall Creek sand at the East Salt Creek wildcat, possibly indicating another in the series of discoveries along the west and southwest flank of the Powder River basin. This area of Wyoming has been the most active from both a development and exploratory drilling standpoint for the past 2 years. The well is 1 East Salt Creek, SE SW SW 10-40n-78w, approximately 4 miles east of the closest producer in old Salt Creek field, Natrona County. The test was made of the zone at 4,532-49 ft. with tester open 1 hour. There was a good blow of gas in 40 minutes with the recovery of 450 ft. of 35°-gravity oil and 120 ft. of heavily oil and gas-cut mud. The well is approximately 265 ft. higher structurally than a well drilled a year ago east of the present wildcat.

Oil has been recovered in another Williston basin, Montana, wildcat, further increasing the interest in this large basin. Shell Oil Co. 1 Fee, SW SW NE 30-12n-57e, Wibaux County, on the Pine Unit, made 370 ft. of 30°-gravity oil and 180 ft. of oily gassy mud on a 55-minute test of the zone 8,924-75 ft. There was a gas blow at the surface in 9 minutes on the test and flowing pressure was unofficially reported at 260 psi. The operator has not reported the formation the recovery was made from but it is believed to be Devonian or possibly Ordovician. Shell has reported top of Charles at 7,100 ft., Mission Canyon 7,585 ft., and Lodgepole 7,976 ft. This wildcat is approximately 75 miles southeast of Shell's Richey wildcat, which tested oil from the Charles formation and is now drilling below 9,410 ft. The well is also more than 175 miles southwest of the Amerada Petroleum Corp. discovery in the Beaver Lodge area, Williams County, North Dakota. Shell is coring ahead on the wildcat following the test.

Seaboard Oil Co. is continuing to find oil in the Morrison (?) at the Whistle Creek wildcat at 1 Unit, NE NW SW 16-56n-98w, Park County, Wyoming. On a drill-stem test at 4,383-4,400 ft. the well made 1,170 ft. of 38°-gravity oil in 2 hours, with flowing pressure 400 psi. On another test at 4,453-81 ft., with tool open 1 hour, the recovery was 116 ft. of water with 30 ft. of oil. The Morrison was topped at 4,386 ft. and a previous test also found oil in the top of the formation. Seaboard is drilling below 4,594 ft. on the well, which is planned as an Embar formation test. This wildcat is located southwest of South Elk Basin field, and southeast of Seaboard's Silver Tip field, which produces oil from the Frontier and Phosphoria formations.

Four new pay and new discovery wells were completed in Wyoming this week. Final completion for the Continental Oil Co. 1 Unit at West Sussex listed the well good for 450 bbl. of oil daily from the Shannon sand. The well was drilled into Lakota and failed to find production in the lower zones. It is 5 miles west of the closest producer in Sussex field proper, where Continental and others have had a continuous drilling program during the past year. Sinclair made a new Frontier discovery in the Happy Springs Unit, Fremont County, with the well north of previous producers in the field. The new well is apparently across faults in the area. Atlantic Refining Co. completed a Phosphoria discovery for a new pay completion at Riverton field, Fremont County. The well flowed 101 bbl. of distillate daily through choke from that formation, with previous wells completed in the Tensleep. Continental had a new pay Tensleep producer at Gebo, Hot Springs County, where previous wells have been completed in Phosphoria.

WYOMING SUCCESSFUL WILDCATS

Happy Springs, Fremont County: Sinclair Oil & Gas Co. 7 Unit, NW SW NW 8-28n-93w, TD 5,400 ft., PB 4,300 ft.

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swabbed 98 bbl. of 37°-gravity Frontier oil.

Riverton: Atlantic Refining Co. 3 Unit, C SW NE 25-1s-4e (WRM), TD 12,335 ft., flowed 101 bbl. distillate.

Hebo, Hot Springs County: Continental Oil Co. 32 Unit, NW NW SE 23-44n-95w, TD 5,198 ft., PB 5,140 ft., flowed 26 bbl. oil.

West Sussex, Johnson County: Continental Oil Co. 1 Unit, NW SE NW 8-42n-79w, TD 6,160 ft., PB 2,950 ft., flowed 9 bbl. oil.

WYOMING WILDCAT FAILURE

Shetard dome, Washakie County: Ohio Oil Co. 1 Snyder-Govt., SE SW NE 24-47n-90w, TD 409 ft., dry.

COLORADO WILDCAT FAILURES

South Price, Archuleta County: J. R. Butler 1 P. C. Crowley, C NW SW 8-32n-2e, TD 4,110 ft., dry.

North Sterling, Logan County: C. E. McCaughey 1 B. Rinaldo, SE NE SW 17-8n-52w, TD 4,718 ft., dry.

Brush area, Morgan County: J. M. Huber-Denver Basin Oil Co. 1 Twombly, SW SW SE 9-3n-56w, TD 5,618 ft., dry.

Paradox, Montrose County: American Liberty Oil Co. 1 Federal, C SW SW 10-46n-17w, TD 10,846 ft., dry.

Yuma County: Carter Oil Co. 1 Ed Henik, NW NW SE 8-1n-48, TD 4,100, dry.

MONTANA WILDCAT FAILURES

Pike Creek, Fergus County: W. E. Burks 1 Bastian, E½ NE SE 7-12n-25e, TD 2,302 ft., dry.

P. L. Ferguson 1 Hughes, S½ SW SE 22-13n-24e, TD 660 ft., dry.

WESTERN NEBRASKA SUCCESSFUL WILDCAT

McCourt area, Cheyenne County: Brown Drilling Co. 1 Scheeler, NE NE SE 11-16n-48w, TD 4,301 ft., pumped 85 bbl. oil, Niobrara 3,400 ft., Ft. Hays 3,652 ft., Codell 3,752 ft., Greenhorn 3,928 ft., first Dakota 4,158 ft., second Dakota 4,233 ft., third Dakota 4,293 ft.

WESTERN NEBRASKA WILDCAT FAILURE

South Dalton, Cheyenne County: An-Son Petroleum 1 Oberbrackling, NE NE SW 5-16n-49w, TD 4,773 ft., dry.

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Canadian Fields

Saskatchewan New Area Gets Second Producer

CALGARY.—Royalite Oil Co., Ltd., and Albercan Oil Corp. have found oil at their first follow-up venture to the heavy crude oil discovery made in the Coleville area of west central Saskatchewan. That discovery was made in the Basal Cretaceous sands, and this second well, now assured of oil from that horizon, will be carried down as a test of Devonian prospects.

The current driller, Royalite-Albercan-Coleville 2, in LSD 5, 30-31-23w3, is located ¼ mile north of the first well which discovered crude oil with gravity around 15°. A string of 9⅝-in. casing has been run to bottom 2,743 ft. as a protective measure, preliminary to deepening in search of Devonian reef. The Coleville 2 is scheduled to be carried down to around 4,500 ft. The discovery well completed in the Cretaceous.

Results of four 1-hour drill-stem tests reported from the new well are as follows: At 2,676-90 ft., recovered 440 ft. of oil; at 2,695-2,703 ft., 60 ft. of oil and 30 ft. of mud; at 2,704-13 ft., 185 ft. of oil; at 2,723-33 ft., 60 ft. of oil, 200 ft. of oil-mud emulsion, and 70 ft. of oil-cut mud.

The discovery well opened up more than 60 ft. of oil-bearing sand without encountering water below, indicating that a heavy crude oil reservoir of considerable depth and extent may be present in that area. The project is located about 2 miles south of Coleville rail point, 12 miles east of Smiley town, and 15 miles northwest of Kindersley.

Cardinal Petroleums, Ltd., and Admiral Oils, Ltd., found a moderate flow of natural gas at the Cessford area well located about 100 miles east of Calgary. Cardinal-Admiral-Cessford 1, in LSD 7, 19-23-12w4, about 5½ miles southwest of Canadian Delhi-Cessford area gas wells, obtained its gas in the top of the Viking sand. Company officials reported that a drill-stem test from 3,210-16 ft. gave a flow of natural gas at the rate of 400,000 cu. ft. daily, and that there was a slight show of oil when the pipe was pulled. Coring and testing is being continued.

Canadian Delhi Oil, Ltd., has found natural gas at rates over 5,000,000 cu. ft. daily from the Lower Cretaceous during drill-stem tests at its latest extension venture in the Cessford area. The new well, Canadian Delhi-Cessford 10, is located in LSD 1, 27-25-12w4. Three 1-hour drill-stem tests were reported this week: At 3,291-3,308 ft., recovery was a maximum natural gas flow rate of 5,417,000 cu. ft. daily; at 3,308-23 ft., gas flow was 5,017,000 cu. ft. daily; at 3,323-33 ft., 4,360,000 cu. ft. of gas daily.

Texaco Exploration Co. and McColl-Frontenac Oil Co. team is preparing to start drilling operations at another venture in the Majeau Lake area of central Alberta, about 4½ miles northwest of Texaco's "wet gas" discovery well in that region.

The new step-out test is Texaco-Majeau Lake C-1, in LSD 4, 14-57-4w5, about ½ mile west of Majeau Lake and 40 miles northwest of Edmonton. The discovery well in that area, Texaco-Majeau Lake 2, in LSD 3, 25-56-4w5, made its strike in the Madison limestone. That well found an indicated 85 ft. of pay zone, and during flow tests of the perforated 30-ft. interval at 4,210-40 ft., rated natural gas at around 10,000,000 cu. ft. daily. With that gas came

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about 1 bbl. hourly of 60°-gravity condensate and about ⅕ bbl. of free water. This discovery is located around 15 miles southeast of the Barrhead area where considerable natural gas and some heavy crude oil was found in the Madison wells drilled by the Stanolind-Imperial team, O'Meara Canadian Drilling Co., and Great Plains Development Co. of Canada, Ltd.

CANADIAN SUCCESSFUL WILDCAT

Gulf-C.P.R.-Gough 10, LSD 10, 23-36-20w4, TD 6,187 ft., 1,788 bbl. oil daily.

CANADIAN WILDCAT FAILURES

Seaboard Bittern Lake 1, LSD 9, 14-47-22w4, TD 5,582 ft.

Pacific-Highland Park 1, LSD 3, 27-82-6w6, TD 5,277 ft.

Canadian Delhi-Lily 1, LSD 11, 14-58-23w4, TD 3,305 ft.

Canadian Delhi-Winnifred 2, LSD 9, 27-11-10w4, TD 3,160 ft.

casing for production tests. Pay was cored at 1,431-37 ft. No drill test was made. Nearest other production is in the Cordes pool, 4 miles to the southwest, and in the West Dubois pool, about the same distance to the southeast.

Oil Management, Inc., 1 Calbert, NE NE SE 31-5s-10e, 4 miles southeast of Carmi, White County, recovered 380 ft. of clean oil and 60 ft. of mud-cut oil without any water in a 60-minute drill-stem test of the Pennsylvanian Biehl sand at 1,842-50 ft. Casing has been run for completion. Location is southwest of the Epworth pool and north of the Storms pool.

ILLINOIS WILDCAT FAILURES

Clinton County: Harry R. Lippitt 1 Berry, SE SE NE 7-1n-2w, dry, TD 2,691 ft.

Devoco Oil Co. 1 Jannett, NE SE NE 1-1n-3w, dry, TD 2,625 ft.

Fayette County: Al Schierman 1 Dochring, NW NE NE 27-6n-2e, dry, TD 1,949 ft.

C. E. Nance 1 Adams-Welch, NW SW SW 11-8n-2e, dry, TD 1,958 ft.

Gallatin County: N. V. Duncan and Aurora Gasoline Co. 1 Moye, NE NE NW 1-8s-9e, dry, TD 2,694 ft.

Hamilton County: E. A. Obering 1 Schilling et al., SW NW SW 6-4s-5e, dry, TD 3,415 ft.

D. H. Bolin 1 LeCross, NE SW NW 10-4s-5e, dry, TD 3,538 ft.

Lawrence County: Olds Oil Co. 1 Dunham, SW SW SE 32-3n-12w, dry, TD 2,295 ft.

Montgomery County: E. H. Jahn 1 DeVries, SW SE SW 30-7n-5w, dry, TD 905 ft.

Edgar White 1 Rebham, SW SW NE 14-10n-4w, dry, TD 900 ft.

Richland County: Calvert Drilling, Inc., 1 Calvert-Porter, SW NE NE 22-4n-9e, dry, TD 3,100 ft.

Bell Brothers 1 Taylor, SW SW NE 16-4n-10e, dry, TD 3,035 ft.

Wabash County: Indiana Farm Bureau 2-A

Central Area

ILLINOIS

Discovery of another Devonian-Silurian "reef" field in the Clinton-Washington County area on the west side of Illinois basin is indicated by showings and saturation found by Gulf Refining Co. in its 1 Elmer Oelze, NW NE SW 3-1s-5w. The location, in southwestern Clinton County, just north of the Washington County line, is 5 miles northwest of Okawville, northern Washington County, where Devonian-Silurian reef production was opened earlier this year, and approximately 15 miles to the west of another Devonian-Silurian reef discovery well, also in southern Clinton County, now being completed by Stanford Oil Co. It is 18 miles southwest of the Frogtown North pool, opened last April, where important production is being developed in a Devonian-Silurian reef.

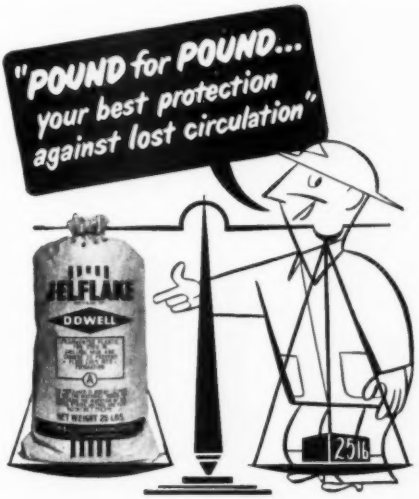
Gulf's well topped the Devonian-Silurian section at 1,943 ft., and, as this is written, is being cored ahead below 2,065 ft. Most of the section has had good porosity and saturation. No water has been indicated. A 90-minute drill-stem test was made 19 ft. in the pay, getting a good show of gas and recovering 15 ft. of oil and 15 ft. of oil-cut mud. No additional test had been made at latest report.

Stanford Oil Co.'s new well, 1 School Board, NW NE NE 26-1n-3w, just north of the Washington County line, flowed 150 bbl. of oil per day natural in 3 days in a production test of Silurian lime at 2,600-11 ft., and is being put on the pump for completion. In the meantime, this company's 2 School Board, a location test of No. 1 in the NE NE NE 26, has reached the pay, finding porosity and saturation, and has casing run to the top at 2,595 ft. for testing. Total depth is 2,618 ft.

Peak Drilling Co. is testing a new McClosky lime discovery well in Jefferson County. The well, 1 Brown, SE SE NW 8-3s-4e, 7 miles southeast of Mt. Vernon and a mile north of the Opdyke townsite, filled 2,700 ft. of oil and 168 ft. of oil-cut mud in a 60-minute drill-stem test of the pay, logged at 3,053-63 ft. No water was indicated. The location is 1½ miles southwest of the West Markham City pool.

A shallow Pennsylvanian sand discovery is indicated in the northwest corner of the same county where Ervin & Bassett Drilling Co. cored 5 ft. of good oil saturation at 1,025-30 ft. in its 2 Hartley, SW SW SW 19-1s-1e. Operators have run casing for completion without a drill-stem test. The location, 7 miles south of Centralia, is east of the Irvington pool and southwest of the Cravat pool.

Dale Hopkins cored good oil saturation in Benoist (Bethel) sand in his 1 Kruski, NE NE SE 33-2s-2w, 4 miles southeast of Nashville, Washington County, and has run



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Zimmerman, SW SE NW 10-1s-12w, dry, TD 4,217 ft.
Wayne County: D. H. Bolin 1 Johnson, NW SW NW 31-1s-6e, dry, TD 3,201 ft.
White County: Oil Management, Inc., 1 Lichtenberger, NW NW SE 24-5s-8e, dry, TD 3,329 ft.

INDIANA SUCCESSFUL WILDCATS

Daviess County: Englebert Michel 1 Ketchem, SE NE SW 19-5n-5w, IP 20 bbl., Aux Vases 526-33 ft., TD 533 ft.
Knox County: Cline & Lambert 1 Nelson, SW SE SE 30-2n-8w, IP 30 bbl., Jackson sand, TD 1,275 ft.
Pike County: Juan Drilling Co. 1 Wilkinson, NW SW SW 7-1n-8w, IP 10 bbl., Jackson sand, TD 1,160 ft.

INDIANA WILDCAT FAILURES

Clay County: T. & H. Corp. 1 Worth, NE NW SW 35-9n-7w, dry, TD 2,001 ft.
Daviess County: Cline & Lambert 1 Robinson, NE SW SW 32-2n-6w, dry, TD 1,411 ft.
Charles Bury 1 Davis, SE SE SW 9-2n-7w, dry, TD 1,361 ft.
Gopher Drilling Co. 1 Guy, NE NW SW 19-2n-7w, dry, TD 1,367 ft.
Gibson County: Cline & Lambert 1 Wright, NW SE SW 28-2s-9w, dry, TD 1,930 ft.
George & Wrather 1 Stewart, NE NE SE 14-3s-10w, dry, TD 2,121 ft.
Knox County: Illinois Mid-Continent Co. 1 McGriffin, Survey 19-2n-9w, dry, TD 1,709 ft.
William Stapp 1 Lake & Donaldson, SWC NE NE SE 24-2n-9w, junked hole, TD 1,551 ft.
Harrison Eiteljorg 1 Cox, Military Donation 65-3n-9w, dry, TD 1,519 ft.
Lohman & Johnson 1 Ray, Military Donation 246-3n-9w, dry, TD 1,728 ft.
Posey County: V. R. Gallagher 1 Wolf-Harlem, NW SE SW 22-7s-15w, dry, TD 2,640 ft.
Putnam County: Hays & Kennedy 1 Zeiner, SE SE NW 3-13n-4w, dry, TD 2,072 ft.
Vigo County: A. J. Walker 1 Boyle, NW NW SW 36-11n-9w, dry, TD 2,005 ft.

MICHIGAN

A Richfield oil pay logged at 5,048-54 ft. at Louis Rose 1 Brocht, N 2 NE SE 2-20n-6w, Winterfield Township, Clare County (a deeper zone test), showed 2,100 ft. of free oil in 10-15 hours early this week. Later the same day, the well flowed about 2 bbl. of oil to tank storage. The wildcat was deepened 1 ft., and samples showed saturated dolomite pay. At the new depth, 5,055 ft., it kicked off and flowed 47 bbl. of clean oil in 30 minutes. Following this first big head flow, it was still flowing at a reduced rate.

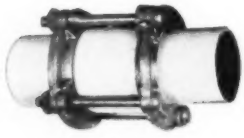
The new potential discovery is located in the heart of Cranberry Lake Stray sand gas storage reservoir. It is also located just a mile east by south from Leonard Drilling Co. 1 Miltner Richfield test which was drilled in 1944 to a depth of 5,205 ft. The Miltner carried Richfield showing pays but was not completed as a producer in that zone. The pay being tested in the 1 Brocht appears to be about 80 ft. above the best oil showing section in the 1 Miltner, but this earlier-drilled test did carry a show of oil and water at about the same point in the Richfield from which the 1 Brocht is now flowing oil.

The new strike is owned by Louis Rose, Charles Bohn, and Harvey Freuhauf, all Detroit industrialists. The play was assembled by Frank Rand and R. H. Wolcott, and was farmed to Rose et al by John P. O'Neill, all of whom have an interest in the well and 3,500-acre drilling block. Contributing companies who supported the test with either dry hole letters, acreage donations, or both, include Leonard Drilling Co., Roosevelt Oil & Refining Corp., Ohio Oil Co., Pure Oil Co., Gulf Refining Co., Sun Oil Co., and Sohio Petroleum Co. Rose and associates announced that they would drill the south offset location to the 1 Brocht immediately.

MICHIGAN WILDCAT FAILURES

Allegan County, Cheshire Township: Harry Stroud 1 Stout, SE NW SW 34-1n-14w, Traverse 1,311 ft., dry, TD 1,343 ft.
Fillmore Township: W. C. Vandenberg, Jr., 1 Kruithof, SE SE SW 18-4n-15w, Traverse 1,480 ft., dry, TD 1,519 ft.
Isabella County, Wise Township: Union Development Co. 1 Ankney et al, SW NE NW 24-16n-3w, Dundee 3,747 ft., dry, TD 3,815 ft.
Montcalm County, Maple Valley Township: Superior Oil Co. 1 Wheeler et al, SW NW NW 3-11n-9w, Traverse 2,842 ft., dry, TD 2,878 ft.
Pine Township: Moco Co. 1 Tygensen, SW NW SE 9-11n-8w, Dundee 3,322 ft., dry, TD 3,469 ft.
Muskegon County, Fruitland Township:

(Continued on page 188)



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Appalachian-Ohio

United Fuel Brings In Fair Oriskany Well

PITTSBURGH—In Elk district, Kanawha County, West Virginia, United Fuel Gas Co. 7-X52A-7104 was completed gaging 1,494,000 cu. ft. of gas in the Oriskany sand; total depth was 5,404 ft. In Beaver Pond district, Mercer County, United Fuel Gas Co. 6748 A. W. Hicks, elevation 2,834 ft., is drilling at 7,587 ft. Big lime was recorded at 1,752-3,092 ft., and the Berea sand at 3,925-56 ft. In Portland district, Preston County, Hope Natural Gas Co. 9673 Nina Kay, elevation 2,296 ft., ran 8-in. casing at 1,479 ft. In Union district, Eberly & Snee 1 Clarence Jones, elevation 1,830 ft., recorded the Onondaga at 4,611 ft. and the chert at 4,651 ft. Hope Natural Gas Co. 9638 Margaret C. Kraus, elevation 2,128 ft.,

topped the Onondaga at 4,949 ft. and the chert at 4,976 ft.

Southwest Pennsylvania.—In Napier Township, Bedford County, South Penn et al, Snee & Eberly 1 Jesse B. Miller, elevation 1,666 ft., have resumed drilling after casing repairs and are at a depth of 8,905 ft. In South Buffalo Township, Armstrong County, Pittsburgh Plate Glass Co. 2-839 Mary A. McGinley estate, elevation 1,153 ft., is drilling at 6,409 ft. In Unity Township, Westmoreland County, Peoples Natural Gas Co. 1-4003 A. J. Dotterway, elevation 2,094 ft., is shut down at 739 ft.

Maryland.—In Garrett County, seven new operations have been announced: W. H. & A. A. Rader 1 Evangelical Church, moving in; Johnson Bros. 1 W. M. Fuller, location; Ray Kite 1 Alvin Friend, moving in; Roy Fletcher 1 A. W. Killius, building rig; Mid-Atlantic Oil & Gas Co. 1 Baltimore & Ohio R. R. Co., moving in; Heath 1 George Kite, rig completed; Heath 1 H. C. Gibson, cellar dug. The Oriskany sand was recorded at 3,852 ft. in Richard Downing 1 McClain, elevation 2,505 ft., and the well is drilling at 3,900 ft.

OHIO

No wells of consequence were reported as completed for the week, but several wildcats and step-outs now drilling are being watched with interest.

In Plymouth Township, Ashtabula County, N. E. Development Co. is drilling the 1 Radio Station WICA, probably to test the Austinburg sand. Ohio Fuel Gas Co. 1 Daniel Mast, Section 11, East Union Township, Wayne County, a rank wildcat, will test the Clinton sand. The same company also has started drilling a Clinton test on Paul Lichty, Lot 21, Wadsworth Township, Medina County.

Waverly Oil Works has stepped out ½ mile for a test on 1 Noble H. Hazelbarger, Section 3, Tiverton Township, Coshocton County. Benedum-Trees 1 S. A. Wilson was drilled through the Medina sand with a small oil and gas showing in the Clinton. The test was plugged and the rig moved 2 miles to the east for another test on 1 Kehota Mining Co. (Cameron), Section 13, Monroe Township, Perry County.

Louisiana-Arkansas

Pace City Field Gets New Pay

SHREVEPORT.—Lion Oil Co. is preparing to complete a new pay discovery in Pace City field, Ouachita County, Arkansas. The well, 3 Solomon, is located in NE NW SE 25-15s-18w. It was drilled to 3,305 ft., with casing run to 3,241 ft. and perforated at 3,104-12 ft. Estimated production was 100 bbl. of oil daily from the Travis Peak which was topped at 2,847 ft.

McAlester Fuel Co.'s deep wildcat in Columbia County, 1 Gean, was to run electric log at 7,800 ft. The well cored shows of oil and condensate in the Smackover at 7,682-92 ft. and 7,692-97 ft., and recovered oil, gas, and salt water on a drill-stem test at 7,684 ft.

North Louisiana.—Concordia Parish's new pool, Lismore Landing, received a new pay horizon at H. L. Hunt E-5 Fisher Lumber Co., C SW SW 15-6n-7e. The new strike is a southwest offset to the pool opener, Hunt E-5 Fisher in NE SW of the same section. The new oil well flowed 149 bbl. of 46 -gravity oil per day from perforations in Wilcox sand at 5,850-55 ft., more than 500 ft. lower than the producing level in the first discovery well.

A good oil show was found in a Pettit lime wildcat south of Haynesville field in Claiborne Parish, and production tests were slated to begin shortly. W. T. McElwee et al 1 Deloach-Goodwin, C NE SW 34-22n-8w. Operators recovered some 23 ft. of porosity in the Pettit, 17 ft. being in the upper zone from 5,705-22 ft. and 6 ft. in the lower interval at 5,768-72 ft. Total depth is 5,785 ft., with pipe cemented at 5,768 ft. on top of the indicated lower Pettit pay.

Atlantic Refining Co. is running production string preparatory to testing its Webster Parish wildcat in Sibley field. The test, 1 Phillip Holley, is located 1,880 ft. south and 660 ft. west of the NE cor. 26-18n-9w. The test was drilled to 10,880 ft. in the Cotton Valley, but plugged back to 9,405 ft. to run casing. A drill-stem test at 8,578-8,626 ft. in the Travis Peak had a good show, and 14 ft. of condensate was cored at 8,626-40 ft.

In the same parish, Halsey & Stewart 1 Crichton-Bellevue, north offset to Skelly Oil Co. 1 E. L. Stewart, East Bellevue field discovery, will start testing the Tuscaloosa where a good show was found in a drill-stem test at 2,446-72 ft. Oil shows were found also in the Pettit, but there was no porosity. The new venture is spotted in 7-19n-10w.

NORTH LOUISIANA WILDCAT FAILURES

Bossier Parish: Serio 1 Winstead, C SW NE 3-9n-7e, dry, TD 5,005 ft.

Pan American 1 McCloud, NE NE NE 13-15n-11w, dry, TD 3,170 ft.

Caddo Parish: Hunt Oil and Gulf Refining 62 Louisiana Delta Lumber Co., C SW SW 9-3n-5e, dry, TD 8,000 ft.

ARKANSAS WILDCAT FAILURES

Nevada County: McAlester Fuel 1 Grove Land & Timber Co. "B," 365 ft. from S and W lines 13-14s-21w, dry, TD 1,313 ft.

Ouachita County: McAlester Fuel 1 Reynolds "A," NW NW NE 19-14s-16w, dry, TD 2,161 ft.

THE OIL AND GAS JOURNAL

"This is the Smith Brothers. But I don't know which is which!"

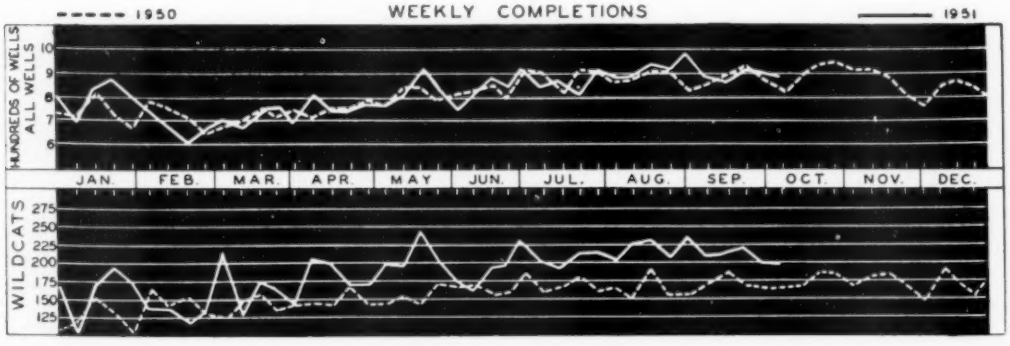
CURRENT STATISTICS

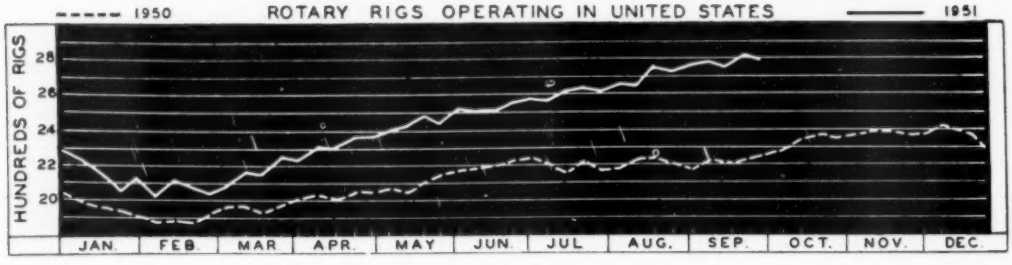
EXPLORATION

WEEKLY WELL COMPLETIONS . . . WEEK ENDED OCTOBER 6, 1951

	Total of all wells					Oct. 6		Wildcat completions and discoveries					Cumulative total, 1951				
	Comp.	Oil	Gas	Dry	Footage	1951	1950	Oil	Dist.	Gas	Dry	Total	Oil	Dist.	Gas	Dry	Total
New York	15	8	0	*7	21,405	502	538	0	0	0	0	0	0	0	0	0	0
Pennsylvania	32	15	6	†11	58,070	1,115	1,044	0	0	0	0	0	0	0	0	1	1
West Virginia	29	5	19	5	74,111	462	511	0	0	0	0	0	0	0	9	6	15
Ohio	16	7	4	5	40,192	727	771	0	0	0	0	0	1	0	5	18	24
Indiana	38	10	0	28	67,129	999	1,224	3	0	0	13	16	37	0	1	277	315
Kentucky	26	9	1	16	54,355	923	866	1	0	0	6	7	21	0	1	121	143
Illinois	48	14	0	‡34	122,320	1,806	2,123	0	0	0	15	15	58	0	0	426	484
Michigan	14	4	0	‡10	39,300	592	674	0	0	0	6	6	21	0	7	227	255
Kansas	80	42	13	‡25	277,481	3,341	2,964	1	0	0	14	15	159	1	13	659	832
Nebraska	6	3	0	3	28,675	176	85	1	0	0	2	3	8	0	1	87	96
Oklahoma	101	52	3	§46	344,514	4,261	4,135	1	0	0	10	11	142	4	17	549	712
Texas	317	184	23	110	1,574,196	12,740	12,542	15	1	1	66	83	568	44	91	2,624	3,327
North Central (Dist. 7-B & 9)	68	50	0	‡38	323,367	3,866	3,792	6	0	0	25	31	273	2	12	1,123	1,410
West (Dist. 7-C & 8)	87	70	0	17	536,700	3,353	3,778	6	0	0	13	19	142	9	6	492	649
Panhandle (Dist. 10)	29	9	14	6	104,078	551	715	0	0	0	3	3	2	0	0	21	23
Eastern (Dist. 5 & 6)	22	14	1	7	94,504	921	884	0	0	0	2	2	9	8	0	180	197
Gulf Coast (Dist. 2 & 3)	56	25	7	24	385,589	1,767	1,749	2	1	1	12	16	73	17	46	368	504
Southwest (Dist. 1 & 4)	35	16	1	18	130,153	1,782	1,624	1	0	0	11	12	69	8	27	440	544
Louisiana	53	33	4	16	302,321	1,621	1,875	0	0	0	4	4	31	8	7	217	263
Northern	30	18	3	9	95,648	883	1,002	0	0	0	3	3	9	0	4	131	144
Southern	23	15	1	7	206,673	738	873	0	0	0	1	1	22	8	3	86	119
Arkansas	10	6	1	3	24,917	314	312	0	0	0	2	2	12	1	3	63	79
Mississippi	11	6	0	5	77,903	273	243	0	0	0	4	4	12	3	0	110	125
Southeastern States	0	0	0	0	0	43	46	0	0	0	0	0	0	0	0	20	20
Montana	4	1	0	3	11,967	167	187	0	0	0	2	2	0	0	0	39	39
Wyoming	19	14	0	5	96,492	572	444	4	0	0	1	5	12	0	1	92	105
Colorado-Utah	10	4	1	5	53,289	217	67	0	0	0	5	5	7	0	4	102	113
New Mexico	12	7	0	5	53,702	510	475	0	0	0	3	3	16	0	8	57	81
California	47	34	0	13	156,376	1,758	1,365	2	0	0	10	12	40	0	4	350	394
Miscellaneous	0	0	0	0	0	59	43	0	0	0	0	0	1	0	20	22	43
Total United States	888	458	75	355	3,478,695	33,178	32,535	28	1	1	163	193	1,146	61	192	6,067	7,466
Total previous week	907	491	82	334	3,632,242			36	3	8	151	198	1,118	60	191	5,904	7,273
Total October 6, 1950	824	449	56	319	3,077,139			25	2	5	131	163	852	60	160	4,867	5,939

Service wells included: *7, †11, ‡1, §4, ¶2





DAILY AVERAGE PRODUCTION FOR WEEK

	Oct. 6 crude oil	B. of M. Oct. demand	Sept. 29 crude oil
Alabama	3,050	2,400	3,050
Arkansas	77,300	85,000	77,250
California	986,200	980,000	982,700
Colorado	78,300	77,000	78,100
Eastern	58,500	62,000	58,100
Florida	1,550	1,600	1,700
Illinois	169,100	165,000	167,600
Indiana	32,300	31,000	30,900
Kansas	332,600	320,000	330,150
Kentucky	32,200	31,000	32,000
Louisiana	619,325	664,000	625,750
North Louisiana	113,150		112,850
South Louisiana	506,175		512,900
Michigan	37,100	40,000	40,900
Mississippi	100,335	105,000	98,750
Montana	25,000	26,000	24,500
Nebraska	7,400	8,000	7,350
New Mexico	144,775	156,000	145,575
Oklahoma	506,500	530,000	504,950
Texas	2,859,200	2,720,000	2,827,600
Dist. 1 (Southwest)	34,550		33,575
Dist. 4 (Southwest)	266,525		259,450
Dist. 2 (Gulf Coast)	171,475		166,475
Dist. 3 (Gulf Coast)	492,400		486,675
Dist. 5 (Eastern)	55,375		57,100
Dist. 6 (Eastern)	119,375		117,950
East Texas field	271,450		277,200
Dist. 7-C (West)	110,625		103,350
Dist. 8 (West)	1,005,500		992,925
Dist. 7-B (W. Central)	86,400		83,600
Dist. 9 (N Central)	161,225		159,550
Dist. 10 (Panhandle)	84,300		84,750
Utah	3,900	5,000	3,800
Wyoming	187,300	188,000	189,200
Total United States	*6,261,935	6,197,000	6,229,925
Change from previous week, up	32,010		
Canada	109,900		177,000

Total U. S. production January 1-October 6 †1,702,175,230 bbl
Same period last year (crude plus cond.) 1,477,721,440 bbl

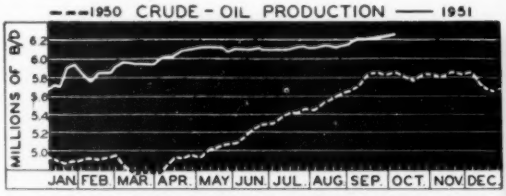
*Not including 105,420 bbl condensate †Including 29,289,120 bbl condensate

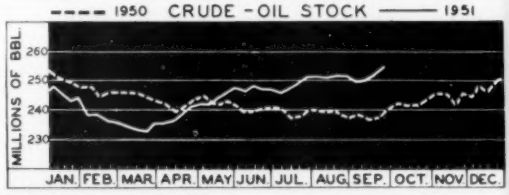
CRUDE-OIL STOCKS BY STATES OF ORIGIN*

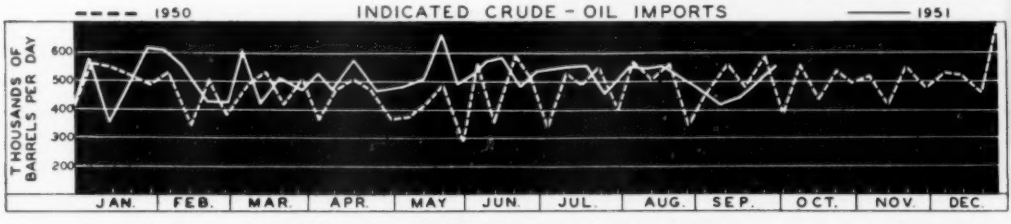
(Thousands of barrels)

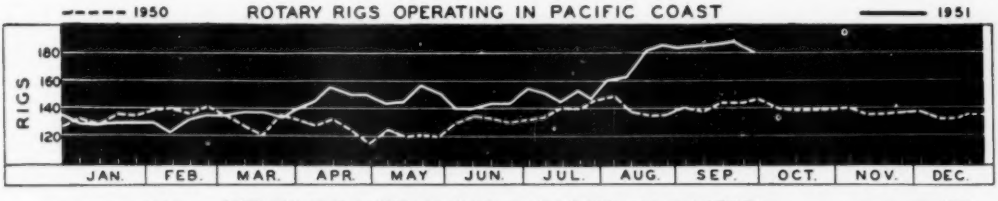
	Sept. 29, 1951	Sept. 22, 1951	Sept. 30, 1950
Pennsylvania Grade	2,130	2,102	2,314
Other Appalachian	1,734	1,668	1,324
Illinois, Indiana, Michigan	12,702	12,962	9,733
Arkansas	2,791	2,869	2,964
Louisiana	15,628	15,397	14,577
North	2,722	2,580	3,482
Gulf	12,906	12,817	11,095
Mississippi	3,249	3,160	2,665
New Mexico	6,853	6,826	6,494
Oklahoma and Kansas	38,552	38,409	35,412
Texas	121,939	118,917	119,015
East Texas	15,013	14,329	13,629
West Texas	51,740	49,995	47,190
Texas Gulf	25,913	26,331	28,757
Other Texas	29,273	28,262	29,439
Rocky Mountain	13,081	13,125	10,420
California	29,632	30,030	30,944
Foreign	7,208	7,104	5,769
Total	255,519	252,569	241,631

*Bureau of Mines.







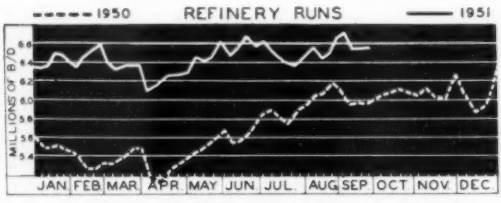


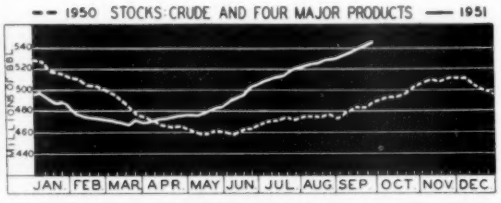
A.P.I. REFINERY REPORT, SEPTEMBER 29

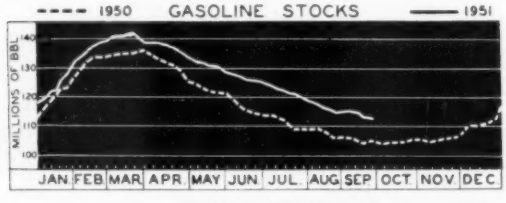
(Thousands of barrels)

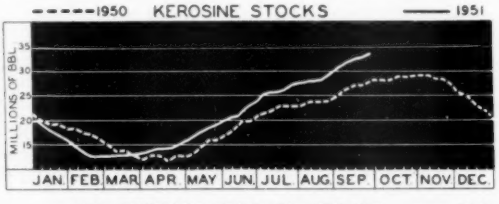
District	Daily avg. crude runs	Daily average production: Gasoline*	Kerosine	Distillate	Residual	Stocks at refineries, bulk terminals, in transit and in pipe lines: Gasoline†	Kerosine	Distillate	Residual	Bureau of Mines, September 1950: Daily avg. crude runs	Daily average production: Gasoline*	Kerosine	Distillate	Residual
East Coast	1,045	399.7	39.1	245.9	211.2	24,241	12,371	33,166	12,103	983	386.5	43.9	219.2	219.8
Appalachian														
District 1	112	49.4	6.0	14.0	11.7	2,812	641	1,077	667	105	46.2	6.3	11.9	10.1
District 2	57	32.6	6	10.6	9.0	1,544	319	456	212	73	35.5	4.8	8.4	14.6
Ind., Ill., Ky.	1,136	397.8	69.4	177.0	150.3	23,973	7,706	21,002	5,846	993	512.7	59.7	166.4	141.5
Okla., Kans., Mo.	558	290.3	29.7	141.7	57.6	11,896	1,936	11,292	1,949	510	287.4	17.3	119.1	55.5
Inland Texas	248	177.7	12.0	42.3	42.0	3,731	613	1,763	1,103	212	149.2	10.5	32.1	34.6
Texas Gulf Coast	1,575	650.4	112.7	339.6	230.7	17,422	5,574	12,205	6,714	1,473	664.8	111.3	322.0	259.0
La. Gulf Coast	322	233.3	72.3	110.1	57.1	5,165	2,950	3,565	2,144	496	237.1	56.7	115.2	62.9
N. La. and Ark.	83	31.0	7.3	18.7	6.4	2,971	636	982	189	78	28.2	8.2	17.4	8.8
Rocky Mountain:														
New Mexico	13	7.9		3.0	4.0	113		67	39	13	7.0	4	2.2	3.2
Other Rocky Mtn.	218	100.6	7.0	41.4	41.7	3,641	457	2,136	1,108	195	87.5	4.9	37.4	34.4
California	988	399.4	8.0	159.1	368.6	14,067	634	5,296	15,495	928	406.5	9.0	128.4	333.7
September 29, 1951	6,538	3,012.1	561.1	1,303.4	1,199.3	127,776	33,837	97,619	47,569	6,659	2,812.6	353.9	1,179.7	1,178.1
September 22, 1951	6,520	3,107.4	541.9	1,363.9	1,194.0	113,072	33,529	95,164	47,614					
September 30, 1950	6,051	2,803.4	353.0	1,204.6	1,186.6	104,583	27,849	76,734	42,590					

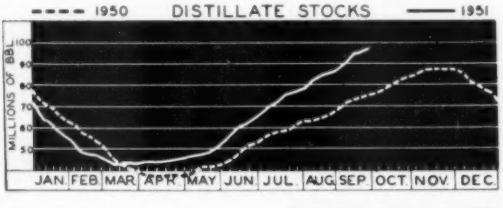
*All refineries including natural blended. †Finished and unfinished.

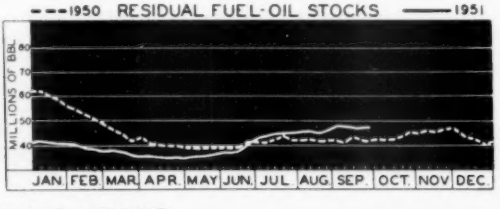


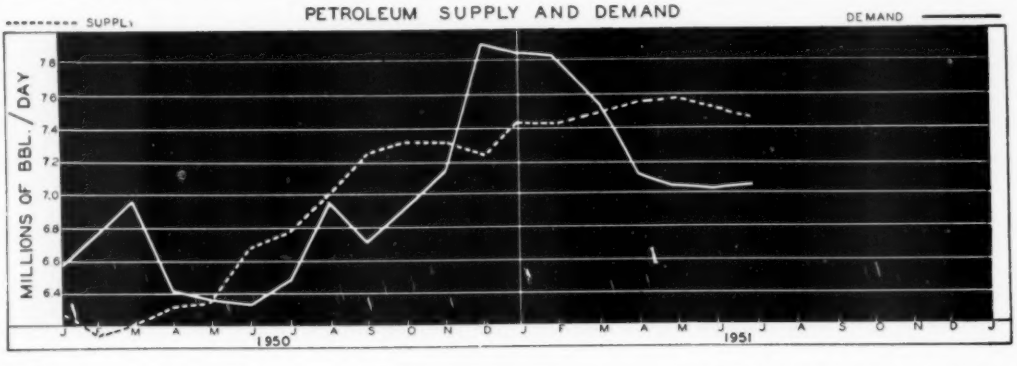












CRUDE PRICES
GRAVITY SCHEDULE

	Signal Hill, Calif.‡	Oklahoma, Kansas	Gulf Coast Tex.*	West Tex.†
18-18.9	$1.93			
19-19.9	1.98			
20-20.9	2.03	$2.25		$2.12
21-21.9	2.07	2.27		2.11
22-22.9	2.12	2.29		2.16
23-23.9	2.18	2.31		2.18
24-24.9	2.24	2.33	$2.56	2.20
25-25.9	2.30	2.35	2.58	2.22
26-26.9	2.36	2.37	2.60	2.24
27-27.9	2.41	2.39	2.62	2.26
28-28.9	2.46	2.41	2.64	2.28
29-29.9	2.52	2.43	2.66	2.30
30-30.9	2.57	2.45	2.68	2.32
31-31.9	2.62	2.47	2.70	2.34
32-32.9	2.68	2.49	2.72	2.36
33-33.9		2.51	2.74	2.38
34-34.9		2.53	2.76	2.40
35-35.9		2.55	2.78	2.42
36-36.9		2.57	2.80	2.44
37-37.9		2.59	2.82	2.46
38-38.9		2.61	2.84	2.48
39-39.9		2.63	2.86	2.50
40 and above		2.65	2.88	2.52

*For crude from Daboval, El Campo, and Sand Point.

†Includes Lea County, New Mexico. Last general price change represented a 50-cent increase becoming effective December 6, 1947.

‡Standard Oil Co. of California.

FLAT CRUDE PRICES

Representative posted schedules per barrel	
East Texas†	$2.65
Kettleman Hills, California*	2.50
Beauregard Parish	2.60
Illinois Basin	2.77
Pecos County, Texas (Yates)	2.35
Bradford, Pennsylvania	4.25
Eastern Ill. and Western Ind.†	2.77
Tomball, Texas Gulf Coast	2.83

*37°-37.9° †35° and above

NATURAL gasoline increased another half cent a gallon on October 2 to reach the ceiling for that product. Group 3 price for Grade 26-70 is now 6.875 cents a gallon and North Texas is 6.375 cents.

The rise in natural prices started much later this year than last, but the increases have been larger and cover a shorter period.

In 1950, Group 3 price for Grade 26-70 at the beginning of summer was 5.125 cents a gallon. The first increase for the summer came near the first of July when 0.25 cent a gallon was added. From that time until the end of September, six other small increases brought the price up to 6.375 cents. It was not until near the middle of December that the final 0.5 cent was added to establish a price of 6.875 cents which was later recognized as the ceiling. It may be possible that a major factor in the very slow climb in natural prices in 1950 was the low level reached by natural at the end of winter. Early in March 1950, Grade 26-70 had dropped to 4 cents a gallon.

Natural prices this year was down from the ceiling to 5.5 cents by the first week in April and remained at this level throughout the summer months. The first increase of 0.375 cent came in the first week of September. By September 12 high demands had pushed the price up to 6.375 cents. The last raise of 0.5 cent, effective October 2, placed all of the season's gain within a 4-week period.

Very little change has been reported in refined-product prices for the Mid-Continent. The few suppliers who are having to move some residual fuel this month because of shortage in tank space are receiving at least 10 cents a barrel less than they expect to get for the same grade of material in November. Some distillate which moved under the market in September was raised October 1.

REPRESENTATIVE QUOTATIONS

Representative spot-market quotations of leading suppliers as of October 8, 1951. Figures are f.o.b. plant for tank-car shipments in cents per gallon, except for residual fuel oil which shows the price per barrel and wax, in cents per pound.

GASOLINE, KEROSINE, AND FUEL OILS

	Mid-Continent Group 3	New York Harbor (barge)	Texas Gulf Coast
Regular gasoline, 80-82 octane	$10^{1}/_{4}$-$10^{1}/_{2}$	12-12.75	$10^{3}/_{4}$-11
Premium gasoline, 86-88 octane	$11^{1}/_{4}$-$11^{1}/_{2}$	13.5-13.75	$11^{3}/_{4}$-12
42-44 w.w. kerosine	9-$9^{3}/_{8}$	10	9
No. 2 straw fuel oil	8-$8^{3}/_{8}$	9	8
No. 6 residual	$1.65-1.75	$2.45-2.60	$1.75-1.90

NATURAL GASOLINE

	Group 3	North Texas	N. La.
Grade 26-70	$6^{7}/_{8}$	$6^{3}/_{8}$	$6^{5}/_{8}$
Grade 18-55	8.25	7.75	8.0

LUBRICATING OILS

South Texas

200 vis., No. 2-3 neutral	13-13.5
750 vis., No. 3-4 neutral	16
2,000 No. 5-6 neutral	18-19

LUBRICATING OILS

Mid-Continent

150-160 vis., D bright stock, 0-10 pp.	29-30
200 vis., No. 3 neutral, 0-10 pp.	17.5-18.5

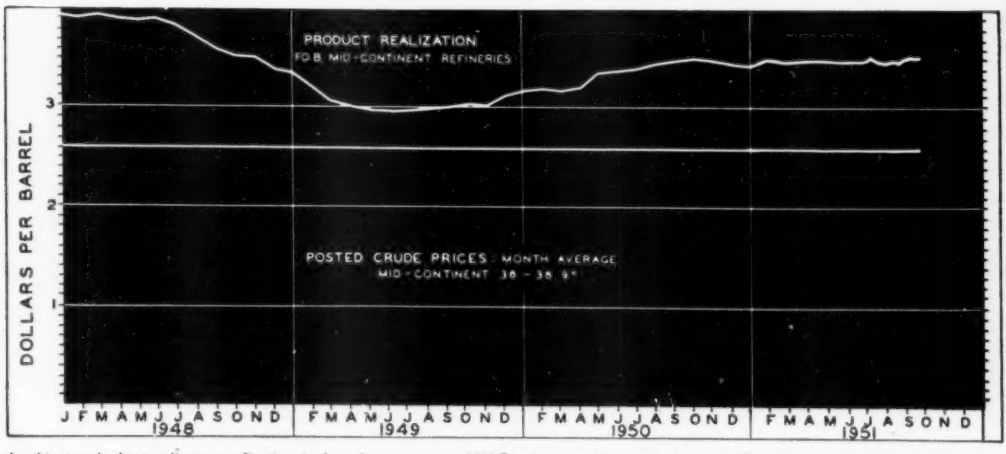
Western Pennsylvania

145-155 vis., 10 p.t. bright stock	32.5
180 vis., 0 p.t. neutral	31.5

WAX

Mid-Continent

132-134 A.M.P.	6.0



In this trend chart refinery realization is based on average Mid-Continent grade crude oil (not 38° gravity only) and average prices for refinery products as published in The Oil and Gas Journal basis Oklahoma (Group 3). Refinery yields confined to gasoline, kerosine, distillate, and fuel oil. Realization averaged $3.53 for week ended September 29, $3.53 for previous week, and $3.51 for September 1950.

Central Area

(Continued from page 182)

Muskegon Development Co. 1 Mull, NE NE NE 30-11n-17w, Traverse 1,685 ft., dry, TD 1,700 ft.

WESTERN KENTUCKY SUCCESSFUL WILDCAT

Hendegson County: George S. Engle 1 Alex Posey, 17-P-23, IP 125 bbl., Waltersburg 1,683-1,710 ft., TD 1,710 ft. (extension Henderson South pool).

WESTERN KENTUCKY WILDCAT FAILURES

Daviess County: Skiles Oil Corp. 1 Coomes, SW SW NW 1-N-27, dry, TD 2,112 ft.

Peak Drilling Co. 1 Smock, 8-O-26, dry, TD 2,308 ft.

Day & Rhodes 1 Williams, SE SE SW 11-O-31, dry, TD 1,200 ft.

Henderson County: Delta Drilling Co. 1 Randolph, 12-P-22, dry, TD 2,702 ft.

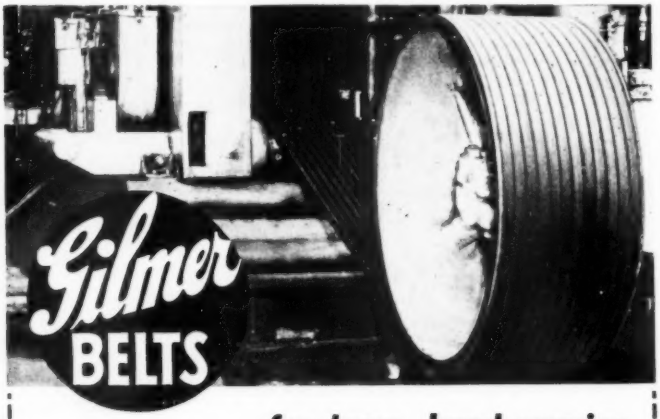
George Engle 1 Lessley, 19-Q-20, dry, TD 2,742 ft.

McLean County: Felmont Oil Co. 1 Bohannon, SW NW SW 12-N-26, dry, TD 2,702 ft.

EASTERN KENTUCKY

In south central Kentucky, and a few miles north of the Tennessee line, a new shallow area has been opened 12 miles southeast of Tompkinsville, county seat of Monroe County. Situated on McFarland Creek, the 1 Ryan well flowed 286 bbl. of oil in 16 hours from a depth of 367 ft.

There are currently six or seven producers in the pool although all are not flowing. The pumping wells make from 20-40 bbl. per day. Pay is thought to be a fractured zone in the Cannon lime, a member of the Trenton formation of Middle Ordovician age. This new pool is located very near to the crest of the Cincinnati Arch.



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EUROPE

New Ship to Be Tested

The world's first merchant ship powered by a gas turbine will undergo sea trials off England next month.

The ship is the Auris, a 12,000-ton tanker of the Shell Petroleum Co. fleet. A gas-turbine alternator unit is now being installed to replace one of four diesel-electric units by which the ship has been powered until now.

The Auris was launched in 1947 as an experimental ship for testing new equipment and operating practices while in normal tanker service.

Advantages of the gas turbine which the sea trials are expected to show are lower running cost, smaller space requirement, less weight, and, with only two moving parts, less engine wear with a consequent lower risk of failure.

German Refining Increases

Production of western Germany's refining industry showed a 14 per cent increase during the second quarter of this year over the first quarter.

Output of all refineries during the April-June period was 1,154,818 tons, compared with a first-quarter output of 1,014,676 tons.

The second-quarter figure is 63 per cent greater than that of production during the same period in 1950.

Part of the increase during the quarter was due to the beginning of operations at the new Ruhrbau GmbH 2,000-bbl. refinery at Muelheim on Ruhr. Throughput at several other plants also has been increased.

During the second quarter the German refineries processed 890,690 tons of imported crude, 296,462 tons of domestic crude, and 31,008 tons of imported semifinished products.

Belgian Plant Nears Finish

The new 30,000-bbl. refinery of Soc Industrielle Belge des Petroles at Antwerp, Belgium, will go on stream early this month.

Anglo-Iranian Oil Co., Ltd., joint owner of the operating company with Cie. Financiere des Petroles, S.A. (Petrofina), last week said all process units have been completed and only minor work remains to be done on utility installations. The refinery will process Kuwait crude oil. Construction was started in March 1950. Contractors were M. W. Kellogg Co. and its European subsidiary, Kellogg International Corp.

The completely integrated refinery will produce gasoline, kerosine, gas oil, and light and heavy fuel oils. It was designed so that operations could be expanded later for production of lubricating oils and high-octane gasoline.

EQUIPMENT MEN . . . in the News

Wells Is Advanced By American Iron

A. P. WELLS

A. P. (Joe) Wells has been appointed division manager for Arkansas, Louisiana, Mississippi, and East Texas for American Iron & Machine Works Co., Oklahoma City. His headquarters will be in Shreveport.

Wells formerly spent 5 years as Illinois representative for National Supply Co., and 5 years for Oil Well Supply Co. in the Rocky Mountain area. Since joining the American Iron sales organization in 1949, he has been assistant district manager in the West Texas district.

Shasta Pump Assets Sold To Barnes Manufacturing

The entire assets of Shasta Pump Co., Oakland, Calif., have been purchased by Barnes Manufacturing Co., Mansfield, Ohio, as announced by Millard H. Pryor, president of Barnes. This plant will operate as a wholly owned subsidiary manufacturing the complete line of Barnes pumps for distribution on the West Coast.

This new organization will be known as Barnes-Shasta Pump Co., and will continue to manufacture in Oakland the former Shasta line augmented by the complete Barnes line now manufactured in the Mansfield plant.

Sales policies of the new company will be directed from Mansfield by Fred B. Hout, vice president in charge of sales. William Stillwell, former West Coast manager for Barnes, has been named sales manager of Barnes-Shasta.

The manufacture of pumps will continue at the present Shasta Pump location in Oakland, under the management of J. E. Piccardo, former president of Shasta Pump, and who has been appointed operating vice president of the new Barnes-Shasta Pump Co.

Deep Rock Awards Contract To Refinery Engineering

The Refinery Engineering Co., Tulsa, has been awarded a contract by Deep Rock Oil Corp. for site preparation and installation of various auxiliary equipment in connection with its lube-oil expansion program at Cushing, Okla.

This announcement was made by Harold Bottomley, vice president in charge of sales for Refinery Engineering. The contract includes installation of a 3,500-g.p.m. cooling tower with pumps and piping, revamping of electrical facilities, the addition of numerous product lines, and the extension of the present fire-protection system.

Engineering is to proceed immediately with field construction to follow shortly thereafter.

Swartwout Co. Opens New Sales Office in Houston

Swartwout Co., Cleveland, manufacturer of power-plant, process-control, and ventilating equipment, has announced the opening of a new sales office in Houston to service the Texas area.

J. B. Downey, Swartwout sales engineer, will manage the power-plant and process-control divisions, and William A. Sharp of Houston will be in charge of roof-ventilator sales engineering and service.

J. B. DOWNEY

W. A. SHARP

Downey, a graduate of Case Institute of Technology, was formerly with the National Carbon Division of Union Carbide & Carbon Corp.

Sharp, a University of Illinois graduate, has served as sales engineer in southern and central United States for several companies, the last being Fluor Co. of Los Angeles, which he represented in the Texas area.

Marz Joins Manzel As Gulf Coast Representative

Manzel, manufacturer of lubricators and chemical feeders, is now represented in the Gulf Coast area by Joseph B. Marz.

Marz has had wide experience in oil fields and is equipped to serve the production men of the industry. He was associated with Sinclair Oil & Gas Co., and Fish Constructors of Houston before joining Manzel.

Graver Water Announces Sales Promotions

Graver Water Conditioning Co., manufacturers of equipment for all water-treating processes, has announced the appointment of Harold R. Fosnot as eastern sales manager with headquarters at the company's home office in New York.

Herman M. Ross, former Graver Cleveland district manager, will replace Fosnot as the Graver Chicago district manager.

Fosnot has been with Graver since 1935. He is experienced in shop fabrication and field erection of water-treatment equipment. He was made Graver Chicago district manager in 1937 where he worked extensively in the industrial and municipal water treatment field.

Ross has been with Graver since 1946 in the company's water-treatment section and is a professional engineer specializing in water-treatment problems.

In Cleveland Graver will be represented by Richard E. Lewis, who was previously in the Graver home office at New York, handling all phases of water treatment.

Campbell Is Division Sales Manager for Calumet & Hecla

E. J. CAMPBELL

The appointment of E. J. Campbell as midwestern district sales manager of Wolverine Tube Division of Calumet and Hecla Consolidated Copper Co. was announced recently by G. D. Potter, general sales manager.

Campbell has been affiliated with Calumet and Hecla since 1943 and has worked closely with both its inside and outside sales staffs. He was promoted to assistant midwestern district sales manager in 1948.

Campbell will supervise sales activities throughout 12 midwestern states from headquarters at Chicago.

National Tank Names Canadian Manufacturer

In line with the growth of the oil industry in Alberta and adjoining provinces, the National Tank Co. has made an agreement with the Dominion Bridge Co., which has been

(Continued on page 194)

CLASSIFIED ADVERTISING

Your MARKET PLACE FOR THE OIL AND GAS INDUSTRY...

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$12.00 a column inch one issue . . .
10% Discount three or more issues.

UNDISPLAYED CLASSIFIED 12c a word one issue. 10% Discount three or more issues. $3.00 minimum charge. Blind Box in our care counts nine words. Payable in Advance.

EQUIPMENT FOR SALE

BOILERS FOR SALE: Three (3) Code Oil Field Boilers. Two 90 HP "Kewanee," 200± WP; one 110 HP "Oilwell Supply," 200± WP. Operated into 1951 under Maryland Casualty Insurance. Good operating condition. Located Tulsa, Oklahoma. Offered subject to prior sale at $900.00 each F.O.B. Contact Kinslow Power & Equipment, Inc., 817 S. Boulder, Tulsa, Oklahoma.

KEYSTONE spudder, trailer mounted, truck and tools. Located Washington County, Oklahoma. Working on seven hundred foot well. Box E-385, The Oil and Gas Journal, Tulsa, Oklahoma.

FOR SALE: Miscellaneous used well materials, flow beans, valves, meters, fittings, check valves, etc. All Series 30. Write for list. Michigan Gas Storage Company, Consumers Power Company Building, Jackson, Michigan.

FOR SALE: 3000' 24 lb. and 2000' 20 lb. lap weld casing. Good body. All good threads & couplings. Take all @ $1.75. M. J. Regan, Coffeyville, Kans.

FOR SALE
In Cleveland, Ohio

Used Allis-Chalmers Turbine Driven Air Compressors—

One 23,000 CFM capacity

One 40,000 CFM capacity

Two used Ingersoll-Rand #40, Type APR Pumps with G.E. Group D, Class 1 Motors, vertical drive. All equipment complete and in operating condition.

The Standard Oil Co. (Ohio)

1401 Midland Bldg., Cleveland 15, Ohio
R. L. Charles MAin 1-7400

NEW STEEL PIPE AND TUBING

4" OD—12 gauge wall
Asphalt coated
Electric Weld
40 foot lengths

3,000 feet

26" OD—.281 wall
Electric Weld
40 foot lengths

Write—Wire—Phone

SONKEN-GALAMBA Corporation
Riverview at 2nd Street
Kansas City 18, Kansas THatcher 9243

X-772

EQUIPMENT FOR SALE

USED ROTARY AND CABLE TOOL DRILLING TOOLS, WIRE LINES, E. A. KELLY, BOX 861, OKLAHOMA CITY. PHONE 5-6407.

FOR SALE: Seamless casing and tubing new and second hand. Phone Rogers Pipe and Supply Co., Tulsa, Okla.

IMMEDIATE delivery complete workover Jackknife rig, and Lowboy mounted Cardwell, Model L, Power Waukesha GKU with 87 double leg mast and wire line and substructure. Details and price on application. Box 3246, Corpus Christi, Texas.

All Used Good Operating Condition

Byron Jackson #460 Triplex Rotary Hook.

McKissick Fig. 482, 48 x 30 traveling block, National Ideal type L Swivel.

Ideal, type D 6 traveling block and rotary connector.

Conrad Jr. line scale 180,000 lb. capacity.

Byron Jackson weldless Elevator Links 2¼" x 72".

2800' 4½" drill pipe.

Mud Pump Unit, Engine, Cummins Diesel Model LI 600, 7" x 10".

National Ideal Pump Model C 150, 6¾" x 12".

Wagner & Wyant Drilling Co.
708 First National Bank Bldg.
Amarillo, Texas. Phone 3-9374.

EQUIPMENT FOR SALE

302 FEET 10-inch seamless casing, like new, 40 pound, 8 V threads. Near Tulsa. 1208 E. 20th St., Tulsa. Phone 3-9232.

FOR SALE: One super model Wilson single drum servicing unit, 80 hp. Waukesha, 4,000' wire, all tubing tools, mounted on GM 4-wheel drive truck. $3500. Phone Rogers Pipe and Supply Co., Tulsa, Okla.

FOR SALE:
USED ELECTRIC POWER PLANT

2 Type G A W, Cooper-Bessemer Engines size 12½ x 15; 150 HP. Serial 40673 & 40674.

2 AC Generators 125 KW, 480 volt, 3 phase, 60 cycle, 900 rpm. Allis-Chalmers. Serial 91210 K 51 DE 21-1 & 2.

Plant complete with coolers, exciters, water pumps, tanks, switch boards and a 32 ft. by 36 ft. house, studding covered by corregated metal siding.
Cost $31,000—priced at $15,000.

Located on Summit Oil & Nat'l. Gas Corp. Kagy Lease in Tonti Pool, 1½ miles Northwest of Salem, Ill. Can be inspected without appointment.

Inquire Wm. Peters, on lease, Box 239, Salem, Ill., or L. A. Mylius, Box 264, Centralia, Ill.

BE PREPARED—BUY NOW!

ONCE USED SEAMLESS TUBING, TESTED 1,000± P.S.I., THOROUGHLY RECONDITIONED, ENDS READY FOR WELDING:

100,000' 2⅛" O.D. x 140" Wall 3.2± 14' Lengths & Over
50,000' 3½" O.D. x 140" Wall 4.8± 14' Lengths & Over
60,000' 4" O.D. x 150" Wall 6.5± 14' Lengths & Over

EXCELLENT FOR HIGH PRESSURE LINE:

12,000' 4" Double Extra Heavy A-106 Grade A Seamless.
6,400' 5" Double Extra Heavy Grade B Seamless.
12,000' 8⅝" O.D. 28± New Wrought Iron Line Pipe, B.E., 21' RML.

OIL WELL TUBING AND CASING:

16,000' 2⅜" O.D. 4.6± Once Run J-55 Range 2 T&C. 10 Round Thread Non-Upset Tubing.
20,000' 5½" O.D. 17± Good Used Lapweld Range 1 T&C. 11½ V-Thread Casing.

OTHER SIZES NEW AND USED CASING, TUBING, LINE PIPE & SEAMLESS TUBING

FOR FULL DETAILS, WIRE OR PHONE AT ONCE

A. J. STRUBEL, Broker

4946 Murdoch, St. Louis Mo. SIdney 1791 (Day Phone) HUdson 8152 (Night Phone)

PIPE

ALL SIZES; LINE PIPE AND CASING TANKS, AND OILFIELD SUPPLIES. EDCO PIPE & SUPPLY CO., PHONES 933 OR 1298, DRUMRIGHT, OKLA.

SPUDDERS, BUCYRUS, Wichita, Fort Worth, also rotaries and core drills. Good used equipment, tools, pipe, cable. Everything for well drilling. Fishing tools rented. Pressey & Son, Pueblo, Colorado.

FOR SALE—Two (2) Horizontal Steel Tanks, 10½' dia. x 37' long; riveted seams; shell ⅜" thick, dished heads ⅜"; 22000 gallon capacity; 50 psi. working pressure; gasoline storage; good condition, located West Texas. Price $1,100.00. Contact Kinslow Power & Equipment, Inc., 817 So. Boulder, Tulsa, Oklahoma.

PIPE THREADING MACHINES

3—#8 Oster Rapiduction, 2½" to 8", 1942
2—6" Landis, 2½" to 6", Late
1—8" Landis, M.D. Late
1—2" Landis, Late
1—#316 Oster, 1¼" to 6"
1—#304 Oster, 1" to 4"

O'Brien Machinery Co.
Div. A. 1545 N. Delaware Avenue
Philadelphia 25, Pa. GArfield 6-1150

EQUIPMENT FOR SALE

FOR SALE: New seamless drill pipe, 6700' 3½" OD 13.30# external upset range 1 & 2 Seal Grip and Shrink Grip threads; 2500' 4½" OD 16.60# internal upset range 1 Shrink Grip threads. Box E-380, The Oil and Gas Journal, Tulsa, Oklahoma.

BETHLEHEM 50 draw works with 145 G.K.U. engine and torque converter, 94 foot mast with substructure. C-150 pump and engine, rotary, swivel and 3,550 foot 3½ inch drill pipe, complete rig now working, $25,000. Model E.C. Cardwell draw works with 2 W.A.K.U. engines, 94 foot Lee C. Moore mast with 6 foot substructure, 60 ton swivel and set B. J. Wilson tongs. Rig now working. Lot $32,500. All the above material located in Central Texas. Norvell-Wilder Supply Company, Box 2178, Houston, Texas. AT-3471.

FOR SALE
Approx 13,000' 2⅞ OD 6.40 New API 10 Rd R 2 Reg. Tubing
25,000' New 5½ OD 15.5 J-55 8 Rd Seamless Casing R 2 L T&C
25,000' New 2⅜ OD 4.7 J-55 8 Rd. R-2 seamless tubing

FRANK MORRIS & CO.
424 So. Cheyenne Tulsa, Oklahoma
Ph. 2-6248

Complete Drilling Rig FOR SALE

Unit rig model 15, two strings of drill pipe, Jack Knife derrick, etc., excellent condition. For further information write

PREMIER WELL SERVICE, INC.
840 Esperson Bldg., Houston, Tex.

SURPLUS DIESEL POWER AND PUMPING EQUIPMENT

Excellent Condition for Immediate Delivery

Diesel Engines

Quantity and make—	Model	H.P.	R.p.m.
2—Busch Sulzer	6B100	600	225
2—McIntosh-Seymour	4B35	500	225
2—Chicago Pneumatic	89CP	400	750

Auxiliary Equipment and Spare Parts Available

Prescott Double Acting Plunger Pumps

Quantity, type, stroke, fluid ends—	Bbl. Day	Max. Press.
6—Duplex, 24 in., Cast Iron	20,000	800 lb.
2—Duplex, 24 in., Fgd. Steel	20,000	900 lb.
1—Triplex, 24 in., Fgd. Steel	30,500	900 lb.

Synchronous Electric Motors

Quantity and make—	H.P.	Volts	Speed
1—Westinghouse	475	2200	257
2—General Electric	500	2300	327

Starting and Control Equipment Available

This equipment has been made available by the construction of a new 18-in. crude oil pipe line between Portland, Maine, and Montreal, Canada, bringing about the elimination of four pump stations.

Detailed Specifications and Arrangements for Inspection Upon Request

PORTLAND PIPE LINE CORPORATION
335 Forest Avenue, Portland, Maine

EQUIPMENT FOR SALE

FOR SALE: Ideal slush pump, Model C-150. Melton Supply Company, Seminole, Oklahoma.

WICHITA FALLS Spudder No. 61 complete with tools 16 inch to 5½ with shear polls and half track for moving. New Allis-Chalmers power unit, all in first class shape and ready to drill. Located in Western Canada. Box E-392, The Oil and Gas Journal, Tulsa, Oklahoma.

FOR SALE: One Bucyrus-Erie 36 L Spudder three and one-half years old. Complete top to bottom tools 15½ to 5½. Also complete tailing in tools. All in first-class condition. List on request. J. E. Griggs, 310 East Third St., Mt. Carmel, Illinois. Phone 959.

FOR SALE: About 6,000 ft. 4½"—16.60# S.H. drill pipe. Fair condition, $1.25 per ft. Phone Altus Drilling Co., Oklahoma City, 3-2331.

COOLING TOWER PUMP FOR SALE: One Wheeler 6" single stage Centrifugal; 1100 GPM at 60' head pressure; direct connected on cast iron base with dual drive; one (1) 25 HP G.E. electric motor and one (1) 25 HP Curtis Steam Turbine. Kinslow Power & Equip., Inc., 817 So. Boulder, Tulsa, Oklahoma.

NEW 10 inch Fox 4 Slip Trip Casing Spear 5½ Spang Drilling Jars 3¾ Joints, discount. Glenn Bradford, 147 Pine, Nowata, Okla.

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3 USED D-13,000 lb. Caterpillars, A-1 shape. 2 12-103 GM Twin diesels. Call or write H. F. (Mike) Ryan, 809 First Natl. Bldg., Tulsa, Oklahoma.

FOR SALE: 18,000' 4" o.d. 6.2 pound seamless line pipe @ 75c; 6,000' 3½" o.d. seamless line pipe @ 60c. Random lengths 35 to 40'. All of this pipe has good body. It is clean inside and out. Straight, beveled, ready to lay. A coating of anti rust paint has been applied. Recently removed from gas line carrying 100 to 150 pound pressure. Ideal for water, gas, air, or oil line. Your personal inspection will convince you of its merits. Prices f.o.b. our yard, Coffeyville, Kans. M. J. Regan, Phones 448 & 3892.

---

90 H.P. Clark Direct driven Horizontal Gas Engine Compressor. 16"-14" x 20". Includes fuel injector adaptor. Mill Creek Gas & Oil Company, Box 509, Clarion, Pennsylvania.

AS IMPORTERS of Steel we can furnish you with European or Japanese Steel Products of all types. Let us have your inquiries. Hemisphere International Corp., 1404 Hibernia Bank Bldg., New Orleans, La.

Gaso Duplex 4⅛" x 6" Power Pumps with Chrysler C-36 Engines, skid mounted immediate delivery. Also Byron Jackson, Carter Centrifugal Units. Westinghouse 20-25-50 KW Generating Units

H. H. COFFIELD
Attn.: W. H. ORR
Phones: 132—Rockdale, Texas
AT-3427—Houston, Texas

FOR SALE
OIL WELL CASING AND TUBING

3,000' New J-55 8⅝" O.D., 24# Seamless 8 R.T., R.1
20,000' New J-55 2⅜" O.D., 4.70# EUE Seamless 8 R.T., R.2
3,600' #1 Used J-55 5½" O.D., 17# Seamless 8 R.T., R.2
3,000' #1 Used H-40 5½" O.D., 14# Seamless 8 R.T., R.2

Package:
(2,300' #1 Used Grade C 5½" O.D., 14 & 15½#, Seamless 10 V.T., R.2)
(800' #1 Used Grade C 5½" O.D., 14 & 15½#, Seamless 10 V.T., R.1)
3,800' #1 Used 7" O.D., 17#, & 20# L.W.

Last Two Items Attractively Priced.

MICHIGAN CARLON PIPE COMPANY
20050 Livernois Avenue, Detroit 21, Mich.
Diamond 1-1400

FINANCING

YOUR FINANCING PROBLEM can be solved at moderate cost. For details write Box E-241, The Oil and Gas Journal, Tulsa, Oklahoma.

EQUIPMENT WANTED

WE BUY drilling equipment, machines, cable tools, pipe, etc. Turn your surplus equipment into cash. Pressey & Son, Pueblo, Colorado.

WANTED: Triplex Type Pumps, minimum 500 barrels per day capacity at 1,000 PSI and 0 to 10 PSI suction and up. 1" Regular Black Line Pipe; 1" long collar line pipe and 1¼" upset tubing. Must be in good condition. Lynch Oil Company, P. O. Box 814, Evansville, Indiana.

HELP WANTED

WANTED

Research and Development Engineer capable of taking charge of department with Oil Field Equipment Manufacturer. Reply giving complete resume stating age, education, experience, positions held, and salary expected. All replies confidential. Box E-346 The Oil and Gas Journal, Tulsa, Oklahoma

KEY Seismograph Personnel Needed by Established and Expanding Seismograph Company. Box E-264, The Oil and Gas Journal, Tulsa, Oklahoma.

HELP WANTED

WANTED: Petroleum Engineer versed in Gas Measurement and Gas Testing. Location South Central Louisiana. House, utilities, salary $247.50 per month. State age, education and experience. Box E-403, The Oil and Gas Journal, Tulsa, Oklahoma.

CHEMIST with technical background and thoroughly familiar with latest method of analysis of light hydrocarbons. Send complete record of education, experience and minimum salary expected. Box E-381, The Oil and Gas Journal, Tulsa, Oklahoma.

NEW

8⅝" and 10"

A.P.I. 8 Rd. Thread

Regular Casing Collars

WILL SWAP FOR:

7⅝", 11¾" and 13⅜" O.D.

New long or regular 8

Rd. Thrd. Casing Collars

On Pound-for-Pound Basis

Call, Wire or Write

Centralia Pipe & Supply Co.

Phone 6771

218 W. Calumet Centralia, Ill.

HELP WANTED

WANTED: Process Engineer who has had at least five years refinery experience. Box E-367, The Oil and Gas Journal, Tulsa, Okla

PROCESS ENGINEERS
Seniors and Juniors

Major Petroleum Refinery Engineering Company Located in New York City desires to expand its Process Engineering Department. Excellent Opportunities for men with Oil Refinery or Chemical Plant Process Engineering experience. Also require several recent Chemical Engineering grads of high scholastic standing. Submit Experience Resume in detail and Past Earnings Record.

Box E-393, The Oil and Gas Journal, Tulsa, Oklahoma

WANTED - ENGINEERS
For WORK in TULSA, OKLA.

Squad Leaders and Draftsmen
Instrumentation
Mechanical Design
Structural
Piping
Electrical
Plant Layout

Contact Chemical Plant Division of

BLAW-KNOX CONSTRUCTION CO.
P.O. Box 1286, Telephone 54-5227
Tulsa, Oklahoma

WANTED
RESEARCH ENGINEERS WITH FIELD EXPERIENCE

The Carter Oil Company's Research Laboratory at Tulsa is expanding its staff. Two engineers, with MS degrees and two to five years oil field experience, are needed. The work includes research in fundamentals of reservoir performance and secondary recovery, and involves applications of newly developed reservoir engineering techniques in studies of foreign and domestic pools.

If you have research ability, the necessary experience, and a good scholastic background, write to:

CHIEF OF RESEARCH
THE CARTER OIL COMPANY
P. O. Box 801
Tulsa, Oklahoma

CAREER OPPORTUNITY FOR
CHEMICAL ENGINEERS
Southern California

RESEARCH ENGINEERS Work is in the field of unit operations, with emphasis on heat-transfer and distillation. Must have advanced degree in chemical engineering and three years or more experience in unit operations, plant-design, or process development for the petroleum or chemical industries. Should be familiar with construction and operation of pilot-plants or full scale commercial units.

PROCESS ENGINEERS Prefer men with advanced chemical-engineering degree. At least two years experience in process design of petroleum refining or petro-chemical process plants. Must be able to meet customers.

Please send a detailed summary of your education, experience, and personal history. Also include a recent photo of yourself. All replies will be kept confidential. Address your letter to Personnel Department.

C F BRAUN & CO

Engineers Fabricators Constructors Consultants

1000 South Fremont Avenue Alhambra, California

HELP WANTED

POSITION available to handle gravity interpretation in Geophysical Department of established oil and gas company, operating principally in the Gulf Coast. Geological background and Gulf Coast experience desirable. Permanent location. Salary open. Give all relevant information in first letter. Personal interview to be arranged. Box E-394, The Oil and Gas Journal, Tulsa, Oklahoma.

HELP WANTED

Young Chemist or Chemical Engineer needed by well-established Eastern Industrial Chemical concern for catalyst testing and evaluation. Some knowledge of petroleum refinery operations preferable. State experience and salary requirements.

Reply Box E-399,
The Oil and Gas Journal, Tulsa, Okla.

HOUSTON OPPORTUNITY

Experienced pipe salesman familiar with Houston area to develop sales contacts among Oil Country trade as well as Industrial, by well established local Independent Distributor. Write briefly background experience, references and age. Good starting salary, excellent opportunity for producer. Box E-372 The Oil and Gas Journal, Tulsa, Okla

SALES ENGINEER

Engineer with production experience, or experienced production man with engineering knowledge to sell and service reputable lines gas regulators, liquid meters, gas-lift equipment, with headquarters Lake Charles, or New Iberia, La. Also new opening new headquarters in Beaumont. Must be over 26 years of age, personality and appearance for sales work. Salary and commission. Automobile furnished. Please furnish detailed experience and minimum salary. **Box E-383, The Oil and Gas Journal, Tulsa, Oklahoma.**

KAYLO
INDUSTRIAL INSULATION
SALES ENGINEER

We require the addition of a capable, qualified, interested sales engineer in our Kaylo Products Division, who is free to relocate. Experience in high temperature applications essential. Age 25-45. Engineering background required. Salary commensurate with ability. Write full particulars to J. A. Sweeny, Director, Selection of Specialized Personnel,

OWENS-ILLINOIS GLASS CO.
P. O. Box 1035, Toledo 1, Ohio

STRUCTURAL DESIGNER WANTED

C. E. graduate major in structural design with 3 to 5 years experience in design of steel and reinforced concrete structures and in general drafting room procedures. Experience in structural design in oil refinery or chemical industry desired. Location Chicago.

Salary up to $7200

Box E-388

THE OIL AND GAS JOURNAL
Tulsa, Okla.

HELP WANTED

INDUSTRIAL Relations Director for middle west corporation. Must have successful record of handling difficult personnel problems honestly, tactfully. Salary in keeping with high level ability required. Application form and particulars on request. Box E-382, The Oil and Gas Journal, Tulsa, Oklahoma.

OIL Industry Employment Service, 405 Tuloma Building, Tulsa, Okla. Tom Robinson, owner, Phone 4-5974. For technical and trained oil industry personnel. Employer pays our fee.

DRILLING ENGINEER wanted by growing independent oil company in West Central Texas. Must be graduate petroleum engineer with two or three years of experience in drilling operations. Please reply by letter furnishing complete personal data, experience, age and starting salary desired. Recent small photo or snapshot would be helpful. Interview will be arranged if justified by data furnished. Box E-395, The Oil and Gas Journal, Tulsa, Oklahoma.

WANTED: Petroleum or Mechanical Engineers for oil tool design. Field experience desirable. State age, education, experience and salary expected. Box F-319, The Oil and Gas Journal, Tulsa, Oklahoma.

ENGINEER to manage national sales to refiners for prominent firebrick manufacturer already selling industry. Experience in refinery maintenance, construction and operation essential; sales experience not; will train qualified man. Salary and bonus. Furnish personal and job history. Box E-402, The Oil and Gas Journal, Tulsa, Oklahoma.

REFINERY ENGINEER: Minimum 3 to 5 years' experience in refinery maintenance, construction and operation, to act as Chief Engineer of substantial Mid-western independent refining company, now undertaking installation of catalytic cracking unit. Write: Box E-375, The Oil and Gas Journal, Tulsa, Oklahoma.

PETROLEUM ENGINEER or technologist for secondary recovery research laboratory in eastern United States. Advanced degree or production research experience preferred. Liberal publication policy. Opportunity to gain first-hand experience in secondary recovery through coordinated laboratory and field research. Salary open. Reply giving educational background and experience. Box E-378, The Oil and Gas Journal, Tulsa, Oklahoma.

ALBERTA

CANADIAN CHEMICALS COMPANY, LTD.

Edmonton, Alberta, Canada

EXPERIENCED CANADIAN PERSONNEL ONLY

Chemical engineers for production supervisory positions in Petrochemical & Cellulose Acetate divisions.

Experienced men for production supervisory positions in Yarn & Staple Fibre Division.

Reply with personal background, education, experience, and salary expected. Personal interviews will be arranged.

All replies will be held confidential.

ADDRESS REPLIES TO
PERSONNEL SUPERINTENDENT
CELANESE CORPORATION OF AMERICA
BOX 148
BISHOP, TEXAS

SITUATIONS WANTED

GEOLOGIST with years of domestic and foreign surface and subsurface experience desires position with an aggressive exploration or progressive independent company in the Rocky Mountain Area. Box E-384, The Oil and Gas Journal, Tulsa, Oklahoma.

PETROLEUM ENGINEER, age 30, married, experienced production, drilling, completion, workover, etc. in West Texas, West Central Texas, and Gulf Coast. Desires connection with aggressive independent. Box E-391, The Oil and Gas Journal, Tulsa, Oklahoma.

EXPERIENCED EXECUTIVE ADMINISTRATIVE ASSISTANT GRADUATE PETROLEUM ENGINEER, 39 years of age, 18 years experience covering Planning, Engineering and Administrative assignments in the Drilling, Producing and Pipeline Divisions of the Oil Industry including Purchasing, Inventory, Material Control and Sales Duties. Staff assignment P.A.W. programing materials last war. Presently employed by Industry in Supervisory capacity; desire change, must be permanent, with aggressive and well established Independent Oil or Gas Company. Prefer to locate in Houston. Box E-390, The Oil and Gas Journal, Tulsa, Oklahoma.

FORMER Independent Oil Operator ten years, with legal education, plus eight years Wall Street experience, desires connection raise funds exploratory well drilling from excess profits taxpayers. Box E-396, The Oil and Gas Journal, Tulsa, Oklahoma.

DESIRE permanent connection with progressive company in Foreign or States. Have had 20 years practical experience in Gas, Natural Gasoline, L.P.G., Refining and Crude Oil Production. Excellent References. Age 40, married, two dependents. Box E-388, The Oil and Gas Journal, Tulsa, Okla.

DISTRICT Representative and Sales Engineer and trouble shooter of Oilfield Equipment. API-ASME Degree. Married, 31, family. Desire immediate change in Midland-Odessa area. 12 yrs. experience. References G. W. Harmon, 1302 W. Washington, Midland, Texas.

ATTENTION: Well established oil well drilling contractor desires to manage and supervise: Individuals', groups' small or medium-sized oil companies' drilling, production and operating problems in Central and Western Texas, and New Mexico. Personal interview by appointment is desired. Makin Drilling Company, Box No 131, Ph. No. 131, Hobbs, New Mexico.

RECENT graduate, with B. Sci. in geology, seeks employment with major oil company as Jr. Geologist. Prefer Rocky Mountain or Mid-Continent area, but will go elsewhere. Married, 27, veteran. Box E-397, The Oil and Gas Journal, Tulsa Oklahoma.

MECHANICAL ENGINEER, four years thorough training with leading major in production and drilling well mechanical operations, desires stateside connection with aggressive independent or foreign assignment with American controlled major. Age 28, single, MS degree, and now employed. Box E-401, The Oil and Gas Journal, Tulsa, Oklahoma.

MR. INDEPENDENT OPERATOR: Are you looking for that capable superintendent, who can take over all of your operational worries and problems? Twenty-one years' experience: drilling, completions, production (flowing-pumping), workovers, salt water disposal, secondary recovery, compressor gas plant construction, practical petroleum geologist, University of Oklahoma graduate in petroleum engineering, Mid-Continent and Rocky Mountain experience. Responsible jobs with majors. Presently employed as superintendent; available November 1. Reason for change: desires to establish residence in one locality to rear family in normal manner. Box E-400, The Oil and Gas Journal, Tulsa, Oklahoma.

GEOLOGIST

Presently employed. Twenty-five years experience subsurface geology and well completions. Interested in proposition from strong active independent.

Box E-377, The Oil and Gas Journal, Tulsa, Oklahoma.

SITUATIONS WANTED

GRADUATE petroleum engineer with 15 years' experience desires operating or engineering position with progressive independent company. Experience includes supervision of drilling, testing, completing, producing, working over, purchasing and installing equipment, and supervising field personnel. Also experienced in office records, reports, maps, and have made various economic surveys. Presently employed with headquarters in North Central Texas. Box E-398, The Oil and Gas Journal, Tulsa, Oklahoma.

LEGAL BLANKS

BURKHART LEGAL BLANKS since 1906 Oil-Gas (all states), Business, Real Estate Legal Forms, Leases, Revised With Government Regulations, Commercial Printing Catalog and Samples on request. Burkhart Printing & Stationery Company, 115 South Cincinnati, Tulsa 3, Oklahoma.

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WILL pay cash instantly for leases (large blocks), royalties, mineral deeds, production. Write fully—P. O. Box 2153, Denver, Colorado.

FOR SALE: Oil and Gas Leases in shallow territory. If interested in a good development proposition near oil producing wells write or wire W. P. Harley, Bowling Green, Ky.

FOR SALE: On a distinct fault, 3000 acres livestock and timber farm in the famous black land, timber and livestock belt of Alabama with half oil rights. Large oil field in adjoining county. Also a large solid block of leases on the same fault, for a well. Write Box A, Linden, Alabama.

UNIT No. 1: N½SE¼, SW¼SE¼ of Section 14, Township 3-North, Range 1-West containing 120.00 acres, more or less, the same being within the ceded portion of the Shoshone or Wind River Indian Reservation, Fremont County, Wyoming. Unit No. 2: NE¼ of Section 14, Township 3-North, Range 1-West, containing 160.00 acres, more or less, the same being within the ceded portion of the Shoshone or Wind River Indian Reservation, Fremont County, Wyoming. Brinkerhoff Drilling Co., 804 Continental Bldg., Dallas 1, Texas.

LEASES ROYALTIES
Producing and Nonproducing
Bought and Sold—Any Area
Inquiries Invited

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WANTED

Unitized gas field producing 4-5 million cubic feet gas per day with liquid content 5 gallons per thousand or more. Operator has complete plant ready to move on site.

Contact: NORMAN STRAUSS

BROWN-STRAUSS CORPORATION
P.O. Box 78—HA-1000
KANSAS CITY 10, MISSOURI

WANTED
OIL INTEREST

I am in a position to furnish oil country tubular goods: casing, tubing, etc., for interest in well for depth up to and including 6,000 ft. Wire or call collect your offer to

DAVID A. SCHLACHTER
6105 Del Norte Lane, Emerson 6026
DALLAS, TEXAS

LEASE AND DRILLING BLOCKS

FOR SALE: 106 acre oil and gas lease, Shelby County, Texas, surrounded by major company activity. $5 per acre. C. A. Parker, Office in Polley Hotel, Center, Texas.

INTERESTED in drilling several wells not over 4,000' in North Texas by December 15th. Give complete description and full details. Box 4343, Dallas, Texas.

LOOKING FOR A LEASE? There will be over 40,000 wells drilled this year. If you are looking for a lease, drilling block, or drilling deal and haven't found it in this column, or if you have a lease or drilling block you want drilled, a Journal classified advertisement can find an interested party. See box heading for classified rates, or write The Oil and Gas Journal.

ROYALTIES

WE will buy producing or non-producing oil royalties. Standard Security Company, 115 Broadway, New York 6.

MONTANA ROYALTIES
Millions of acres now leased by world's major companies, with huge drilling play in prospect. For booklet describing Montana geology and oil development, write Landowners Royalty Company, Box 1225, Great Falls, Montana.

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WANTED
ANY AREA

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WOrth 4-7546

REAL ESTATE

TRANSFERRED to Chicago? Oil man has 5 room brick residence; 6 years old; suburban atmosphere; in Northwest section of Chicago; close to schools and transportation; master bedroom 12' x 18'; automatic heat; blinds, drapes; Bendix washer; garage; side drive; priced to sell, $17,000. Edison-Norwood Realty Company, 6774 N. Northwest Highway, Chicago 31, Illinois. NEwcastle 1-5544.

FOR SALE—MAPS

NEW, LIGHTWEIGHT PLASTIC RELIEF MAPS
VENEZUELA & U.S.A.

For your office, conference room, or home—these new, durable Vinylite plastic relief maps. The Venezuela map, printed in 9 brilliant colors, is 45" x 56" and weighs only 2 pounds. Price: $31.50. The United States Map (over 1,000 now hang in US offices) is 64" x 40", formed in Vinylite and printed in 11 colors. Self-framed. Weight: 2¼ pounds. Price: $37.50. Both maps are as easy to hang as a picture, show relief features as no other map does. Satisfaction guaranteed, or full refund. Immediate shipment. Order now.

AERO SERVICE CORP.
236 E. Courtland St., Philadelphia 20, Pa.

LEGAL

100.75 ACRES of individually allotted, restricted Indian land, located in Sections 27 and 34, Township 13 South, Range 24 East, Salt Lake Meridian, within the jurisdiction of the Uintah and Ouray Reservation, Utah, are being advertised for lease; bids on which will be opened October 29, 1951, at 2:00 P.M., at the office of Forrest R. Stone, Superintendent, Uintah and Ouray Agency, Fort Duchesne, Utah. Full particulars may be obtained from Mr. J. R. Schwabrow, U. S. Geological Survey, Casper, Wyoming, or from the Uintah and Ouray Agency.

EQUIPMENT MEN

(Continued from page 189)

licensed to manufacture National oil treaters in the plant of its Edmonton subsidiary, Standard Iron & Manufacturing Works, Ltd.

Approximately 60 treaters of various sizes have already been fabricated or are in course of manufacture.

Probst Named to High Sales Position by Clark Bros.

Clark Bros. Co., Inc., Olean, N. Y., has announced the appointment of George W. Probst to the position of western regional sales manager.

Probst has been associated with the sales department of Clark for the past 30 years. For the past 10 years he has been the district sales manager of the Tulsa district.

In his new position, Probst will coordinate the sales efforts of the California, Oklahoma, Texas, and Chicago territories. His headquarters will remain in the Clark Bros. sales office in Tulsa.

American Meter Appoints Cutter to Sales Post

American Meter Co. has announced the appointment of Earl B. Cutter as assistant to the vice president in charge of sales.

Cutter graduated in 1939 from Iowa State University with a B.S. degree in mechanical engineering, joining American Meter shortly thereafter, with which company he has been active in sales in the Midwest.

Western Enters License Agreement With W.S.I.

The Western Co., Midland, Tex., has entered into a license agreement with Well Surveys, Inc., Tulsa, to conduct radioactivity well-surveying operations under W.S.I. patents.

The Western Co. is the third service company to be licensed by W.S.I. to operate in the United States, and its trucks and equipment are now in the process of being assembled.

The Western Co. does acidizing and perforating in the West Texas and New Mexico area.

Rockwell Names Bradford Sales Representative

F. J. BRADFORD

C. K. Madison, Houston district sales manager for Rockwell Manufacturing Co., has announced the appointment of F. J. Bradford, Houston, as special sales representative for Nordstrom valves.

Bradford attended both University of Kansas and University of Oklahoma. He has had 18 years experience in selling oilfield equipment in the Mid-Continent and Gulf Coast areas. Bradford is an authority on production equipment, and in his new assignment will specialize on christmas-tree valves.

Rittenhouse to Head New Clark Co. Houston Office

Darwin H. Clark Co. has opened an office in Houston which will be under the direction of Jack Rittenhouse, nationally known agency executive, editor and designer of fine printing. The firm's Los Angeles headquarters, together with the new Houston office, provide exceptional facilities for planning, designing, and producing unusually effective advertising for oil-tool and industrial accounts.

Jack Rittenhouse has been director of technical publications and an account executive with the Clark agency in Los Angeles for the past 5 years. Previously he was head of his own agency in Chicago and executive secretary of Transamerica Advertising Agency Network.

Worthington Names Wilson West Coast Consultant

C. E. WILSON

Charles E. Wilson, sales vice president of Worthington Pump & Machinery Corp., Harrison, N. J., has been appointed a West Coast consultant on sales problems, according to an announcement by H. C. Ramsey, president. Wilson retired from his present position and activities in corporation affairs effective October 1, but wil continue in a consulting capacity on sales problems at Worthington's offices in Los Angeles, San Francisco, Seattle, and Salt Lake City.

Wilson began his career with Worthington in 1892 as an office boy. He soon became a sales representative and in 1905 he was named manager of the Chicago sales territory. He was elevated to various managerial posts, and in 1932 he was elected a vice president, serving from 1934 through 1940 at Los Angeles, and recently in the New York and Harrison offices.

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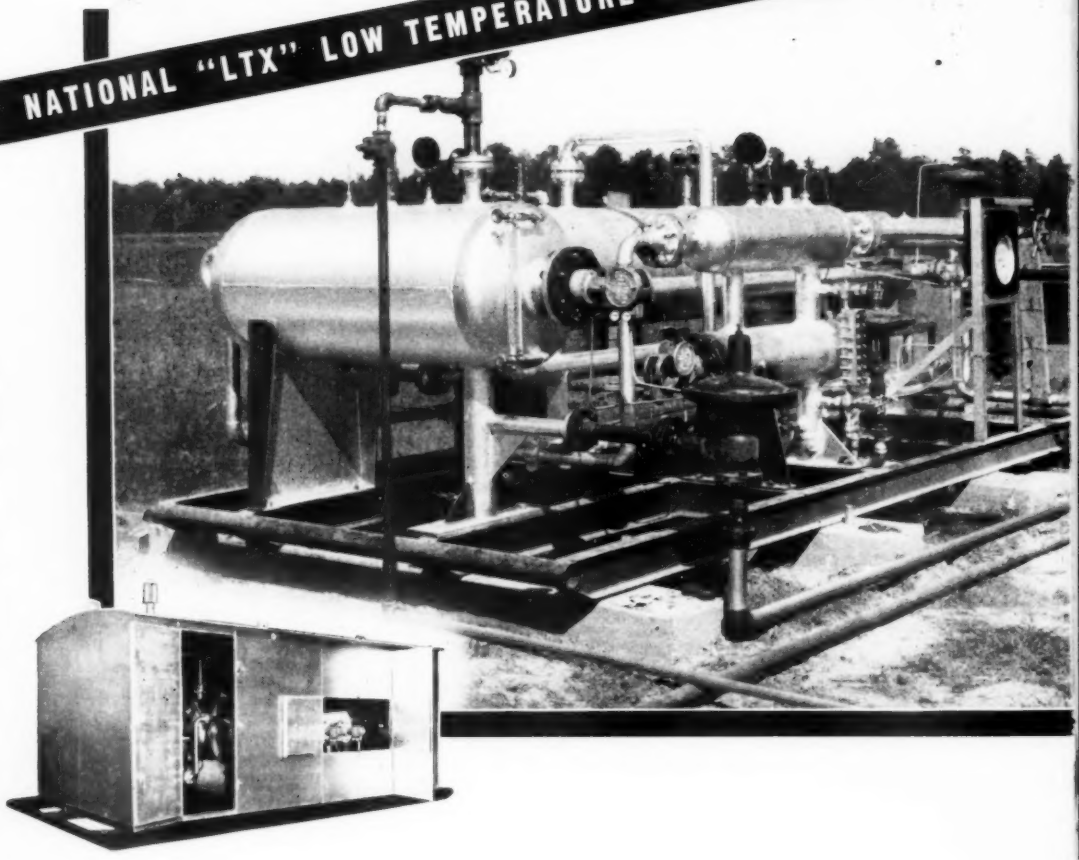

Products engineered by National Tank Company are so designed that they become universal for the task they are appointed to do. "Universal" because they are not tailor-made to fit only one set of conditions. They will do the work on many jobs within their rated maximum capacities.

Many "Firsts" have come from "National" — One of the Latest Firsts is the LTX — Low Temperature Extraction Unit.

National LTX Units Produce Maximum Results at Minimum Costs: 1. Maximum Pressure and Flow Stream Recovery of Stable Distillate. 2. Minimum Water Dew Point of Final Gas Stream; Minimum Hydrocarbon Dew Point.

National LTX Units are made in various sizes and capacities.

Write for further information.

It's a National

NATIONAL TANK COMPANY

TULSA, OKLAHOMA

LAY-SET PREFORMED

the Premium

Only the finest is branded **"Premium."** Only the best gets the blue ribbon for unequalled quality. Only one is recognized as the grand champion winner which sets the standards of excellence . . . whether it's beef on the hoof, a beauty contest winner, or a brand of wire rope.

HAZARD since 1846 has produced premium wire rope . . . made better so that it will last longer, handle safer, and cost less to use. LAY-SET Preformed has been used —with excellent results—in every conceivable type of wire rope service. Its satisfactory performance has proved LAY-SET's right to be called—*"the Premium Brand."*

There is a HAZARD distributor near you to serve you with this premium brand of wire rope.

ACCO *In Business for Your Safety*

AMERICAN CHAIN & CABLE

HAZARD WIRE ROPE DIVISION

ALSO MAKERS OF THE COMPLETE LINE OF Registered WIRE ROPE SLINGS

TRADE MARK

Wilkes-Barre, Pa. · Chicago · Denver · Houston · Los Angeles · New York · Odessa, Tex. · Philadelphia · Pittsburgh · San Francisco · Bridgeport, Conn.

Hughes Bit Production *doubled*

More than twice as many rock bits are now coming off the Hughes production line as were being produced at the close of World War II.

This high rate of production has been made possible by a plant expansion program started in 1946 to place our company in position to meet future emergency bit requirements of the industry.

As a result of this foresightedness, Hughes has been able to keep pace with the unprecedented and unforeseen bit demands of the past two years.

Here, again, is proof of the fact that you can depend upon Hughes to anticipate your rock bit requirements.

HUGHES
TOOL COMPANY
HOUSTON, TEXAS
WORLD STANDARD OF THE INDUSTRY

HUGHES
Tri-Cone
ROCK BITS